Award Number: DAMD17-02-1-0659

TITLE: Process Research and Development of Antibodies as Countermeasures for C. botulinum

PRINCIPAL INVESTIGATOR: Michael Meagher, Ph.D.

CONTRACTING ORGANIZATION: University of Nebraska, Lincoln

Lincoln, NE 68588-0430

REPORT DATE: March 2007

TYPE OF REPORT: Annual

PREPARED FOR: U.S. Army Medical Research and Materiel Command

Fort Detrick, Maryland 21702-5012

DISTRIBUTION STATEMENT: Approved for Public Release;

Distribution Unlimited

The views, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision unless so designated by other documentation.

R	EPORT DOC	UMENTATIO	N PAGE		Form Approved OMB No. 0704-0188
data needed, and completing a this burden to Department of D 4302. Respondents should be	and reviewing this collection of i defense, Washington Headquar aware that notwithstanding any	nformation. Send comments regarders Services, Directorate for Info	arding this burden estimate or an mation Operations and Reports n shall be subject to any penalty	ny other aspect of this co (0704-0188), 1215 Jeffe	ning existing data sources, gathering and maintaining the llection of information, including suggestions for reducing rson Davis Highway, Suite 1204, Arlington, VA 22202-a collection of information if it does not display a currently
1. REPORT DATE (DD	D-MM-YYYY)	2. REPORT TYPE			ATES COVERED (From - To)
01-03-2007 4. TITLE AND SUBTIT		Annual			Mar 2006 – 28 Feb 2007 CONTRACT NUMBER
	and Development	of Antibodies as Co	untermeasures for	○.	GRANT NUMBER MD17-02-1-0659
botulinum					PROGRAM ELEMENT NUMBER
6. AUTHOR(S)				5d.	PROJECT NUMBER
Michael Meagher,	Ph.D.			5e. ·	TASK NUMBER
E-Mail: mmeaghe	r1@unl.edu			5f. V	VORK UNIT NUMBER
7. PERFORMING ORG	GANIZATION NAME(S)	AND ADDRESS(ES)			ERFORMING ORGANIZATION REPORT
University of Nebra Lincoln, NE 68588				N	UMBER
9. SPONSORING / MO U.S. Army Medical Fort Detrick, Maryl	I Research and Ma	IAME(S) AND ADDRESS teriel Command	S(ES)		SPONSOR/MONITOR'S ACRONYM(S)
					SPONSOR/MONITOR'S REPORT NUMBER(S)
12. DISTRIBUTION / A Approved for Publi	_			·	
13. SUPPLEMENTARY	Y NOTES – Original c	ontains colored plates	: ALL DTIC reproduc	ctions will be in	black and white.
14. ABSTRACT					
University of Nebraska-	-Lincoln Biological Proc sity of Nebraska Board	ess Development Facility	. It has taken a significa	ant effort to secure	asement of Othmer Hall, the home for the all the required funding and to have final rt describes the final design and initial
15. SUBJECT TERMS					
No subject terms provid					
16. SECURITY CLASS			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON USAMRMC
a. REPORT U	b. ABSTRACT U	c. THIS PAGE U	UU	25	19b. TELEPHONE NUMBER (include area code)

Table of Contents

Introduction	4
Body	4
CGMP Construction Project	7
Key Accomplishments	9
Appendix	10

Introduction

This project in the past has been comprised of two components. The first component, which represents 95% of the funding, is dedicated to building a Phase I/II CGMP facility in the first floor and basement of Othmer Hall, the home for the Biological Process Development Facility. The other 5% has been used to research the expression of antibodies against the botulinum neurotoxins in Chinese Hamster Ovary (CHO) cells. The last annual report described the completion of the antibody research and will no longer be presented in subsequent annual reports.

This report will describe activities to date on the design and construction of the Phase I/II CGMP Facility. The construction project was fully approved with all of the required funding in November 2006. This project is providing a XX% of the funding, while a second DoD contract is providing XX% and the remaining is being provide by University of Nebraska-Lincoln. This facility will have approximately 5,000 sq. ft of modular clean rooms and 5,000 sq ft of support space. The expected completion date for construction is February 2008 with validation taking an additional 4 to 5 months.

Body

cGMP Construction Project

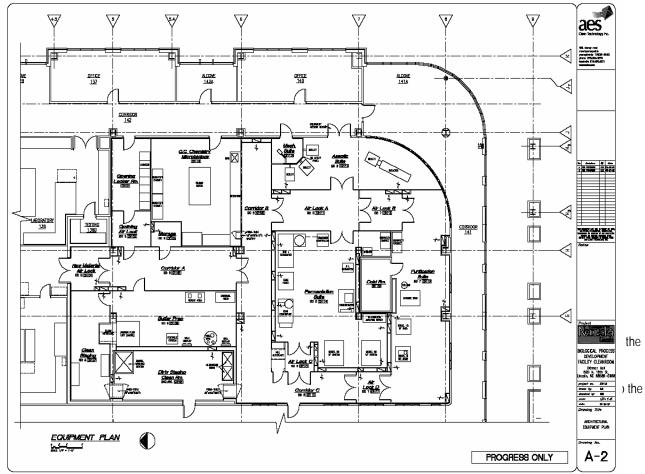
November 2006 the University Of Nebraska Board Of Regents (BOR) approved a **fully funded** CGMP facility to be built on first floor and the basement of Othmer Hall. This CGMP facility will use a modular clean room construction for all clean room space. As of June 1, 2007 all of the bidding has been completed, contractors have been selected and demolition and construction has started. The CGMP construction team includes the following;

- AES Clean Room Technology which is responsible for design, construction, and installation of the modular clean rooms and will oversee installation of all CGMP process piping.
- BioKinetics is a subcontractor to AES and is responsible for all process and utility design, including equipment layout and process piping.
- Davis Design is a local architect responsible for all architectural elements of the project outside the scope of the modular clean rooms.
- Hampton Construction of Lincoln NE is responsible for demolition and construction of all non-clean room space, such as service utilities to the clean rooms and the support space in the basement.
- University of Nebraska-Lincoln Facility Management and Planning has oversight for the project.

The floor plan for the first floor is presented as Figure 1. The basement floor plan is still in the conceptual stage, but a description of functions that will be in the basement are presented below.

The first floor of the CGMP facility will have the following capabilities:

- Fermentation Suite: 150 L working volume fermentor for yeast and bacteria, harvesting and clarifying capabilities using either continuous centrifugation or cross flow membrane filtration and cell disruption.
- *Purification Suite:* 0.1 to 6 L/min chromatography skid and two ultrafiltration systems.
- Asceptic Processing Suite: Isolator system with a VHP (vaporized hydrogen peroxide) unit for sterilization
 capable of producing Master and Working Cell Banks and manual filling of up to 1500 liquid vials.



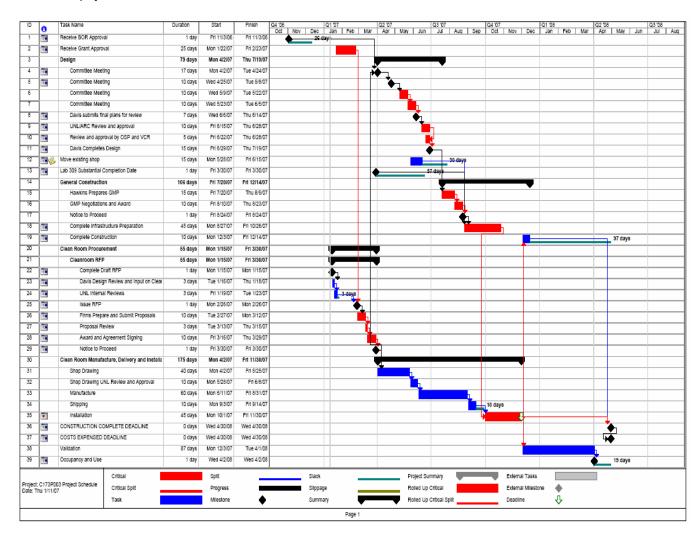
- Stability Chamber Room: The BPDF has 5 validated stability chambers with temperature ranges from -80°C to 70°C. This room will be used house these chambers.
- Final Product Storage Area: This area will house the BPDF's final product storage freezers (-80°C, -20°C) and refrigerators. These units are segregated into quarantine and released units.
- Cell Bank Storage Area. This area will be used for storing Master Cell Bank dewars and Working Cell Bank dewars.
- Gas Storage Area: This area is for storage of oxygen and nitrogen dewars that are need for the fermentation suite and the cell bank dewars, respectively.
- Calibration and Maintenance: This area is a maintenance area for calibration and small maintenance of the CGMP facility.
- *Utility Room:* This is the location for the CGMP utilities, i.e. R.O. water system, pure steam generator, WFI condenser, hot WFI storage tank, WFI distribution system, and CIP skid.
- Document Storage Area: This area will be used to store all of the maintenance documents for the CGMP facility.

Figure 1. First floor layout of CGMP Facility

As of June 16, 2007, design of the clean rooms is at 70%. In the appendix are the 70% drawings generated by AES.

Project Timeline.

Below is the project time.



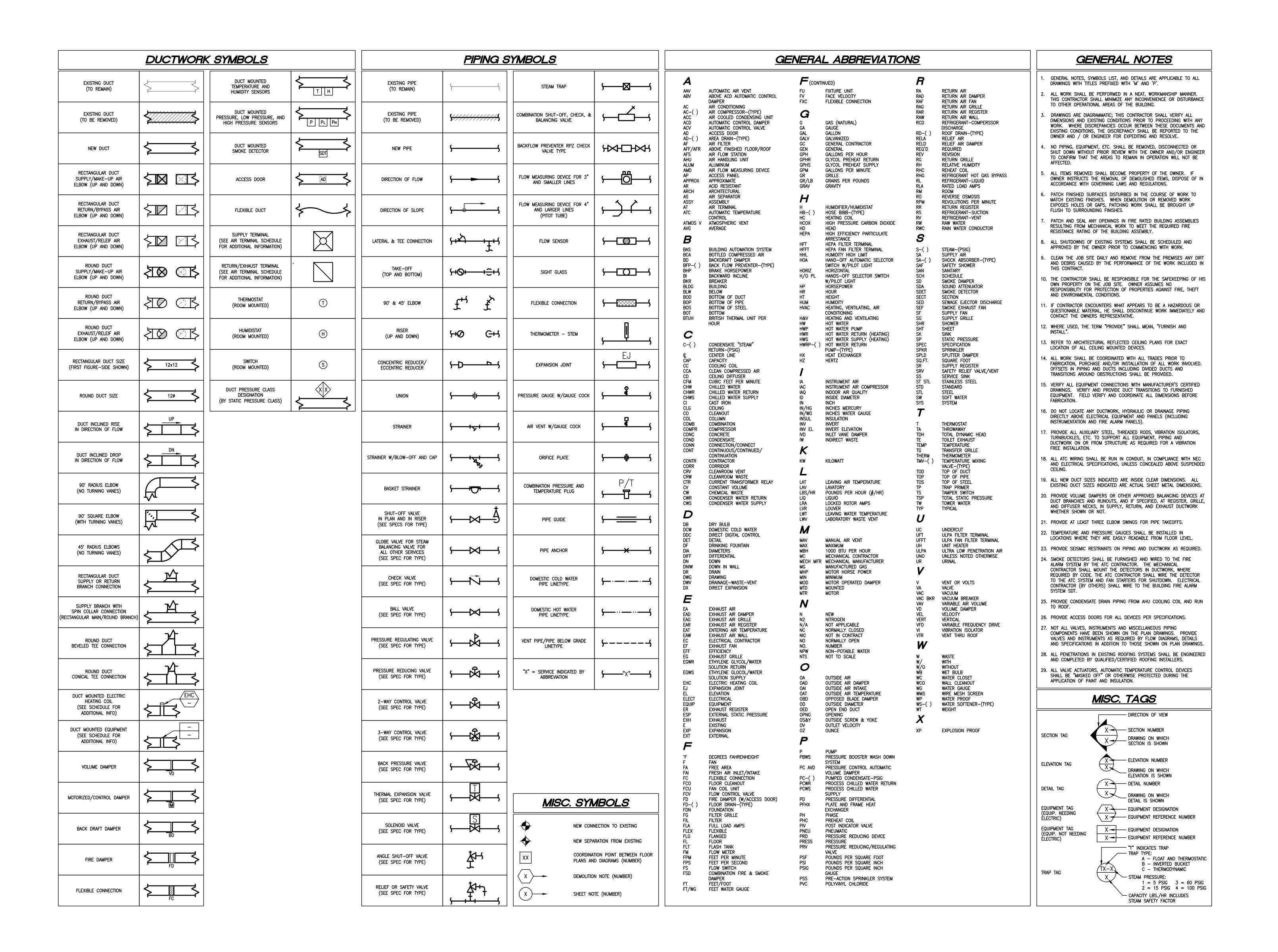
Project Budget

					DRAFT
/10/2007					DRAFI
ONSTRUCTION COSTS	Record of Expenses As Reported 1/3/07		al Project ts Phase II	Record of Expense + Total Project Cost Phase II	
GENERAL CONSTRUCTION CONTRACT	\$ 918,82	3 \$	1,261,000	\$ 2,179,823	3
General Construction Contractor	\$ 5,662	2		\$ 5,662 \$ -	
Other Construction Contractor					
Electrical Elevator				\$	
Sitework/Demolition				\$ -	
arking, Drives, Roads, Walks				\$ -	
Audio Visual				S -	İ
OTHER CONSTRUCTION CONTRACTORS	\$ 328,56			\$ - \$ 328,563	
THER CONSTRUCTION CONTRACTORS	320,30	3		Φ 320,003	All other necessary construction will
Unit Price Contractors		\$	-	\$ -	come from contingency
Itilities Contractor (outside of general contract)		\$	-	\$ -	
NVIRONMENTAL ISSUES/ASBESTOS	ļ			\$ -	\$1,173,068 Removed 10/06/06 per Po
RELOCATION CONSTRUCTION				\$ -	email 91,173,068 Removed 10/06/06 per Po
CONSTRUCTION REVIEW & INSPECTION	ļ			\$ -	
CARPET (INSTALLED BY OWNER)				\$ -	
NTERNAL SERVICES	ļ			s -	·
Energy Management Controls Systems (EMCS) Card Access System Fire Alarm System (included in EMCS) Security System	\$ 35,93	\$	5,000 25,000 30,000	\$ 25,000	BSM budget for controls in the basement only. See 8/22/06 email 2 regarding controls inc. in AES estimate SEI - \$5k x 5 doors
Other UNL Services	\$ 2,96	1		\$ 2,961	
Utilities (UNL Services) Keying of Doors	S 180	0 8	2,000	\$ - \$ 2,180	
Landscaping	101	\$		\$ -	<u> </u>
ELECOMMUNICATIONS		\$	6,000	\$ - \$ 6,000	20 ports @ \$300 ea.
ACCESSIBILITY DEFICIENCIES	 	s	-	\$ - \$ -	
CONSTRUCTION CONTINGENCY		s	385,757	\$ - \$ 385,757	7
			303,737	\$ -	
IXED EQUIPMENT (INSTALL BY OWNER)	<u> </u>	s	2,252,000	\$ 2,252,000	
NLB Estimate		1	2,232,000	\$ 2,252,000	Remove \$140,000 , controls programming by local vendor
ransfer Panel		\$	70,000	\$ 70,000	
nc conting for transfer panel \$70k FOTAL CONSTRUCTION COSTS	\$ 1,304,34	2 \$	4,036,757	\$ 5,341,099)
NON-CONSTRUCTION COSTS					
DESIGN & MANAGEMENT					
Planning & Program Statement			400.000	\$ -	
A & E Basic Services A & E Additional Services	\$ 604,92	0 S S	106,300 72,000	\$ 711,220 \$ 72,000	
A & E Reimbursable Expenses	<u> </u>	\$	28,500		1
TO E TOTAL DELICATION CAPACITORS	·		20,000	20,000	Pharma consultant for final review of
Other A & E Services		s	100,000	\$ 100,000	piping drawings
DO JECT MANACEMENT SERVICES				5 -	
PROJECT MANAGEMENT SERVICES Project Management and Inspection Services	\$ 107,90	3 \$	100.000	\$ 207.903	B Davis Design
OTHER & SPECIALTY CONSULTANTS (BPDF PM)	\$ 166,45		8,129	\$ 174,586 \$ -	Modified 10/6/06 pc email
		·		\$ -	
MOVABLE EQUIPMENT	\$ 454,64	5		\$ 454,645	
					Kill system - planned to award work to Conecraft includes water makeup unit
SPECIAL & TECHNICAL EQUIPMENT	\$ 661,73	1 \$	275,000	\$ 936,731	Conecraft includes water makeup unit and condenser (\$75k)
Calibration and controls programming for ex. Equip	1			\$ -	1
AND ACQUISITION		\$	-	\$ -	
ARTWORK	ļ	\$		\$ - \$ -	
OTHER NON-CONSTRUCTION			2.000	\$ -	
Builders Risk Moving and Relocation	\$ 650 \$ 41,52		2,000 19,000	\$ 2,650 \$ 60,521	
Machine shop decommissioning/moving	+1,32	\$	6,086	\$ 6,086	
nterior Signage	\$ 3,986 \$ 2,566	6 \$	2,000	\$ 5,986) ;
Printing, Advertising, Mailing			20,000	\$ 22,566	
Other Non-construction costs State Fire Marshal Plan Review	\$ 5,72	\$	4,000	\$ 5,723 \$ 4,000	
Building Code Review (inc. in SFM cost)			1,000	\$ -	
stimating Consulting Fee				\$ -	
Non-construction Contingency		\$	95,550	\$ 95,550	1
OTAL NON-CONSTRUCTION COSTS	\$ 2,050,10		838,565	\$ 2,888,667	7
	\$ 3,354,444 \$ 2,836,297		4,875,322	\$ 7,711,619	
ess credit from P002 project funds \$518 147					
ess credit from P002 project funds \$518,147 BOR Approved Funding 11/3/06	2,030,231			\$ 7,711,619	9

Key Accomplishment

The key accomplishment during this funding period is securing all of the needed funding to attain approval by the University of Nebraska Board of Reagents for construction of a Phase I/II CGMP facility.

APPENDIX





422 stump road
montgomeryville
pennsylvania 18936—9630
phone 215.393.6810
facsimile 215.393.6811
www.aesclean.com

ე.	Revisions	Ву	Date
,	70% PROGRESS	OSC	06-01-0
BE	DOCUMENT MAY NOT, E COPIED, PHOTOCOPIE SLATED OR REDUCED MEDIUM OR MACHINE F	D. REPI	RODUCED.

WITHOUT PRIOR CONSENT IN WRITING, FROM

AES CLEAN TECHNOLOGY, INC.

Notes

Project

project no.

checked by RGS

scale NOT TO SCALE

04-13-07

Drawing Title

MECHANICAL LEGENDS AND ABBREVIATIONS

Drawing No.

Mechanical Specifications

1.0 GENERAL MECHANICAL SPECIFICATIONS

- CODES AND STANDARDS
- 1.1.1 ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE LATEST APPLICABLE CONSTRUCTION CODES, GUIDELINES AND STANDARDS AS ADOPTED AND AMENDED BY THE LOCAL MUNICIPALITY.
 - The **Nebraska** Building Code THE BOCA NATIONAL CODE
 - THE BOCA BASIC/NATIONAL MECHANICAL CODE THE BOCA BASIC/NATIONAL FIRE PREVENTION CODE
 - THE NATIONAL ELECTRICAL CODE THE NATIONAL FIRE PROTECTION CODE
 - THE NATIONAL STANDARD PLUMBING CODE ADDITIONALLY, ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF THE OWNER'S STANDARDS, LOCAL ZONING, OSHA, AND ALL OTHER APPLICABLE CODES, TITLES AND REGULATIONS, ALL IN THEIR LATEST EDITION, OF ALL AUTHORITIES HAVING JURISDICTION OVER WORK OF THIS TYPE. SUBCONTRACTORS SHALL NOT PROCEED WITH WORK OF ANY KIND UNTIL PLANS ARE APPROVED BY THE OWNER.
- 1.2 THESE DRAWINGS ARE CONCEPTUAL ONLY. SHOULD CHANGES OR DISCREPANCIES OCCUR, THEY SHALL BE REPORTED TO AES. AES WILL NOT BE RESPONSIBLE OR LIABLE FOR THIS PROJECT SHOULD, CHANGES BE MADE TO THE DRAWINGS OR PROJECT BY THE OWNER AND/OR CONTRACTOR WITHOUT WRITTEN CONSENT FROM AES. DO NOT BEGIN WORK ON DISCREPANCIES OR DEVIATIONS WITHOUT WRITTEN APPROVAL FROM AES.
- CUSTOMER SHALL SIGN-OFF "APPROVED" OR "APPROVED-AS-NOTED" ON AES FURNISHED DRAWINGS AND SPECIFICATIONS PRIOR TO RELEASE OF ORDERING MATERIALS OR COMMENCING CONSTRUCTION.
- 1.4 DO NOT SCALE DRAWINGS FOR INSTALLATION PURPOSES.
- CONTRACTORS SHALL FIELD VERIFY ALL DIMENSIONS AND CONDITIONS PERTAINING TO THEIR SCOPE OF WORK
- 1.6 CONTRACTORS SHALL PROVIDE THE FOLLOWING DOCUMENTS TO AES UPON COMPLETION OF PROJECT:
- ONE (1) COMPLETE SET OF MARKED BLUEPRINTS REFLECTING AS-BUILT CONDITIONS. NOTE: CONTRACTOR SHALL MAINTAIN ONE (1) COMPLETE SET OF "RED-LINE" MARKUPS REFLECTING ONGOING PROGRESS OF AS-BUILTS. MARKUPS SHALL BE RECORDED WITHIN SEVEN (7) DAYS FOLLOWING INSTALLATION.
- MFG. DOCUMENTS ON DAMPERS DUCT MATERIALS, VALVES AND PIPING SPECIALTIES.
- CONTRACTOR SHALL TAKE EXTREME CARE IN PREVENTING DAMAGE TO THE OWNER'S PROPERTY. ANY DAMAGE TO BUILDING, FURNITURE, EQUIPMENT, ETC., SHALL BE REPAIRED OR REPLACED BY CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
- 1.8 RIGGING AND RECEIVING OF ALL EQUIPMENT AND MATERIAL BY CONTRACTOR.
- 1.9 SUBCONTRACTORS SHALL KEEP JOB SITE CLEAN AND FREE OF DEBRIS AND TRASH AT ALL TIMES.
- PERFORM ALL WORK IN ACCORDANCE WITH THE BEST STANDARD TRADE PRACTICES. ALL TRADES AND SUBCONTRACTORS SHALL COOPERATE TO FACILITATE JOB
- ALL WELDING, CUTTING, OR BURNING PERFORMED AT JOB SITE SHALL NOT COMMENCE UNTIL CONTRACTOR RECEIVES PERMISSION FROM PLANT MAINTENANCE PERSONNEL. CONTRACTOR SHALL COMPLY WITH ALL SAFETY REQUIREMENTS AS SPECIFIED ON PERMIT AND SHALL PROVIDE FIRE WATCH, WELDING TARPS, ETC.,
- 1.12 ALL CUTTING AND PATCHING THRU MSS WALLS, CEILINGS, ETC. SHALL BE THE RESPONSIBILITY OF AES CONTRACTORS FOR EACH CONSTRUCTION DISCIPLINE. ALL CUTTING AND PATCHING OF ROOFS, FLOORS, ETC. SHALL BE THE RESPONSIBILITY OF OTHERS.
- 1.13 SECURITY ALL SECURITY PROCEDURES SHALL BE FOLLOWED WITH STRICT ACCORDANCE AS REQUIRED.
- SAFETY CONTRACTOR SHALL STRICTLY ABIDE BY THE OWNER'S SAFETY PROCEDURES AND WEAR EYE PROTECTION, HARD HATS, AND SAFETY SHOES AS
- 2.1 <u>SHEET METAL</u>
- 2.1.1 ALL NEW SUPPLY, RETURN, OUTSIDE, AND EXHAUST AIR DUCTWORK, AS SHOWN ON THE PLANS, SHALL BE FABRICATED AND INSTALLED AS PER THE SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, INC. (SMACNA) GUIDELINES FOR INDUSTRIAL DUCT CONSTRUCTION AND SHALL ACCOMMODATE PRESSURES OF 4 INCHES W.G. UNLESS OTHERWISE NOTED. ALL NEW SUPPLY, RETURN, OUTSIDE, AND EXHAUST AIR DUCTWORK SHALL BE OF GALVANIZED SHEET METAL STEEL: LOCK-FORMING QUALITY, ASTM A-653/A-653-M, COATING DESIGNATION G90 MILL PHOSPHATIZED FINISH FOR EXPOSED SURFACES OF DUCTWORK. ALL SEAMS SHALL BE CAULKED AIR TIGHT TO SMACNA SEAL CLASS "A." FITTINGS SHALL BE MANUFACTURED BY "DUCTMATE" INDUSTRIES OR BY ALTERNATE MANUFACTURERS CONSIDERED. ALL JOINTS SHALL BE FLANGED, GASKETED AND BOLTED PER SMACNA STANDARDS. ALL JOINTS FOR ROUND DUCT SHALL BE FLANGED, GASKETED AND BOLTED AS PER "DUCTMATE SPIRALMATE".
- 2.1.2 ALL DUCTWORK TO BE DELIVERED & STORED AT JOB SITE, CLEANED AND SEALED; DUCT ENDS SHALL BE MAINTAINED AND SEALED DURING THE CONSTRUCTION PROCESS. ALL DUCTWORK INTERIORS SHALL BE WIPED CLEAN WITH 70% SOLUTION OF ISOPROPYL ALCOHOL.
- 2.1.3 DUCT DEVICES SHALL BE CONSTRUCTED OF THE SAME MATERIAL AS THE DUCT IN WHICH THEY ARE INSTALLED.
- 2.1.4 SECURE COUPLINGS OR BRANCH DUCT TIGHT TO DUCT WALL SURFACE. SECURE COUPLINGS WITH SELF TAP SCREWS AS REQUIRED TO SUPPORT CONNECTION
- 2.1.4.1 TAPE SEALING SYSTEM: WOVEN-FIBER TAPE IMPREGNATED WITH A GYPSUM MINERAL COMPOUND AND A MODIFIED ACRYLIC/SILICONE ACTIVATOR TO REACT EXOTHERMICALLY WITH THE TAPE TO FORM HARD, DURABLE, AIRTIGHT SEAL.
- 2.1.4.2 FABRICATE AND INSTALL DUCT, ELBOWS, BRANCH CONNECTIONS, AND OTHER CONSTRUCTION TO MINIMIZE PROTRUSIONS INTO THE AIRSTREAM TO MINIMIZE COLLECTION POINTS FOR DIRT.
- COORDINATE LAYOUT WITH ALL OTHER ABOVE CEILING WORK, INCLUDING SPRINKLER PIPING, STORM WATER PIPING, PROCESS AND UTILITY PIPING, ELECTRICAL CONDUITS, ETC. PROVIDE ALL OFFSETS, RISERS, AND DROPS AS REQUIRED.
- 2.2 <u>ELBOWS</u> ALL SQUARE ELBOWS SHALL HAVE TURNING VANES.

<u>HANGERS & SUPPORTS</u>

- FLEXIBLE DUCTWORK THERMOFLEX TYPE M-KC, CL. 1, PRESS. RATING POS. 16" W.G./NEG. 2" W.G., VINYL INTERIOR LINING, 1-1/2" INSULATION OR
- FLEXIBLE DUCT CLAMPS: STAINLESS STEEL BAND WITH CADMIUM-PLATED HEX SCREW TO TIGHTEN BAND WITH A WORM-GEAR ACTION. PROVIDE IN SIZES FROM 3 TO 28 INCHES TO SUIT DUCT SIZE.
- DUCT SHALL BE SUPPORTED WITH APPROVED HANGERS AT INTERVALS WITHIN 24 INCHES OF ELBOW, 48 INCHES OF BRANCH, AND HORIZONTAL DUCTS. VERTICAL DUCTS AT INTERVALS OF 16 FEET, OR BY OTHER APPROVED DUCT SUPPORT SYSTEMS DESIGNED IN ACCORDANCE WITH "BOCA" AND "SMACNA".
- HANGERS AND SUPPORTS SHALL BE SUITABLE TO SUPPORT DUCT AND EQUIPMENT, SUCH AS HEATING COILS, FANS, AND FIRE DAMPERS. SUPPORT A DUCTWORK FROM THE TOP OF NEW SUPPORT STEEL ABOVE CLEANROOMS. HANGERS, SUPPORT AND STRAP HANGERS SHALL BE FASTENED TO STEEL STRUCTURE BY BEAM CLAMPS OR BY STEEL CLIPS WELDED TO THE TOP FLANGES OF BEAM AND GIRDERS. STEEL ANGLES OR CHANNELS SHOULD BE USED AS SUPPLEMENTARY SUPPORT FOR DUCTS BETWEEN BEAMS.
- DOORS SHALL BE PROVIDED AND SHALL BE MADE AS LARGE AS PRACTICAL. DOORS IN INSULATED DUCTS SHALL BE OF THE INSULATED TYPE. DOORS SHALL BE RIGID WITH FELT GASKETS, GALVANIZED HINGES AND BRONZE PINS, AND BRASS FASTENERS. ACCESS DOORS SHALL BE CONSTRUCTED OF SAME MATERIAL AS
- 2.5.2 INSTALL DUCT ACCESS DOORS TO ALLOW FOR INSPECTING, ADJUSTING, AND MAINTAINING ACCESSORIES AND TERMINAL UNITS AS FOLLOWS:
- ON BOTH SIDES OF DUCT COILS AND DUCT MOUNTED HUMIDIFIERS. DOWNSTREAM FROM VOLUME DAMPERS, AUTOMATIC DAMPERS, TURNING VANES, AND EQUIPMENT.
- ADJACENT TO FIRE OR SMOKE DAMPERS, PROVIDING ACCESS TO RESET OR REINSTALL FUSIBLE LINKS. TO INTERIOR OF DUCTS FOR CLEANING; BEFORE AND AFTER EACH CHANGE IN DIRECTION, AT MAXIMUM 25-FOOT SPACING.

2.5 <u>DUCT ACCESS</u>

- MAXIMUM ALLOWABLE LEAKAGE: COMPLY WITH REQUIREMENTS FOR LEAKAGE CLASS 3 FOR ROUND AND FLAT-OVAL DUCTS, LEAKAGE CLASS 12 FOR RECTANGULAR DUCTS IN PRESSURE CLASSES LOWER THAN AND EQUAL TO 2 INCHES W.G. (BOTH POSITIVE AND NEGATIVE PRESSURES), AND LEAKAGE CLASS 6 FOR PRESSURE CLASSES FROM 2 TO 10 INCHES W.G.
- LEAKAGE ALLOWANCES ARE TO BE INCLUSIVE OF FLEXIBLE CONNECTIONS AND CONTROL PENETRATIONS. SYSTEMS MUST BE TIGHT TO PERFORM PROPERLY AND TO
- ENABLE DESIGN AIR BALANCE INCLUDING RELATIVE STATIC PRESSURES TO BE ACHIEVED. 2.6.3 ALL DUCTWORK SHALL BE LEAK TESTED.
- 2.6.4 SEAL BRANCH DUCT CONNECTIONS AND BELL-MOUTH FITTINGS AIRTIGHT.
- DUCTWORK CONNECTIONS TO TERMINAL DEVICES (GRILLES, DIFFUSERS, TERMINAL HEPA FILTERS) SHOULD BE SEALED AIR TIGHT AS APPLICABLE.
- SHOULD ADDITIONAL DUCT OFFSETS OR FITTINGS BE REQUIRED TO FIT DUCTWORK IN FIELD OTHER THAN THOSE SHOWN ON PLANS, SHEET METAL CONTRACTOR SHALL PROVIDE AT NO ADDITIONAL COST TO OWNER AND AES.
- ALL DUCTWORK ELEVATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY CONTRACTOR.
- 2.10 <u>OUTLETS</u> PROVIDE ALL AIR TERMINALS; HEPA AIR TERMINALS, CEILING DIFFUSERS, REGISTERS, AND GRILLES AS SCHEDULED ON PLANS.
- 2.10.1 PROVIDE SUPPLY AND RETURN DIFFUSERS OF TYPE, CAPACITY AND WITH ACCESSORIES AND FINISHES AS LISTED ON AIR TERMINAL SCHEDULE.
- 2.10.1.1 PROVIDE GRILLES AND REGISTERS OF TYPE, CAPACITY, AND WITH ACCESSORIES AND FINISHES AS LISTED ON AIR TERMINAL SCHEDULE
- 2.10.1.2 GRILLES AND REGISTERS FACES: HORIZONTAL 0 AND 35 DEGREE FIXED BLADES AT MANUFACTURER'S STANDARD SPACING. GRILLES AND REGISTERS PATTERNS (CEILING REGISTERS ONLY): DOUBLE DEFLECTION: 2 SETS OF BLADES IN FACE, REAR SET AT 90 DEGREES TO FACE SET.
- REGISTERS TO INCLUDE ADJUSTABLE OPPOSED BLADE DAMPER ASSEMBLY, KEY OPERATED FROM FACE OF REGISTER.
- 2.10.2 PROVIDE SUPPLY AIR TERMINAL MODULES OF TYPE, CAPACITY AND WITH ACCESSORIES AND FINISHES AS LISTED ON AIR TERMINAL SCHEDULE.

- 2.10.2.1 CONSTRUCTION: THE TERMINAL HEPA FILTER HOUSING AND FRAME SHALL BE CONSTRUCTED OF 10 GAUGE EXTRUDED ANODIZED ALUMINUM MODULE WITH MAXIMUM DEPTH NOT TO EXCEED 3" WITH 12" DUCT COLLAR. A PROTECTIVE SCREEN, EPOXY POWDER COATED STEEL, 62% OPEN AREA.
- 2.10.2.2 EACH TERMINAL DUCTED HEPA REPLACEABLE 53-MM GEL SEALED TYPE FILTER SHALL HAVE MINIMUM REMOVAL EFFICIENCY OF 99.99% ON 0.3 MICRON PARTICLES. EACH FILTER SHALL BE FACTORY SCAN TEST PER SECTION 9.2 OF IES-RP-CC001.3 TO ENSURE FREEDOM FORM LEAKS GREATER THAN 0.01% OF THE TEST CHALLENGE. CENTER DIVIDER WITH ONE PORT FOR ROOM-SIDE ADJUSTABLE DIFFUSER PLATE/STATIC PRESSURE AND ONE PORT FOR ROOM-SIDE SAMPLING/AEROSOL INJECTION RING. EACH HEPA AIR TERMINAL SHALL BEAR LABELS INDICATING MODEL AND SERIAL NUMBER. PROVIDE TEST CERTIFICATE.
- DAMPERS IN RECTANGULAR DUCTWORK SHALL BE OPPOSED BLADE WITH LOCKING QUADRANT, TYPE MD-35 OPPOSED BLADE DAMPER MFG. BY "RUSKIN". SHAFTS SHALL PROTRUDE THROUGH BOTH SIDES OF DUCT WITH STANDOFF TO EXTEND THROUGH INSULATION.
- 2.11.2 ROUND DAMPER AT BRANCH LINES SHALL HAVE SQUARE SHAFT STOCK WITH LOCKING QUADRANT, TYPE MDRS-25, MFG. BY "RUSKIN". SHAFTS SHALL PROTRUDE
- THROUGH BOTH SIDES OF DUCT WITH STANDOFF TO EXTEND THROUGH INSULATION.

2.11.3 FIRE DAMPERS SHALL BE UL CLASSIFIED "FIRE RESISTANCE RATING 1 1/2 HOUR" AND SHALL BE FUSIBLE LINE TYPE WITH DAMPERS OUT OF THE AIRSTREAM.

- FIRE DAMPERS SHALL BE "RUSKIN" TYPE IBDZ OR EQUAL VERTICAL MOUNT. CONTRACTOR TO PROVIDE ACCESS DOORS AT FIRE DAMPERS. 2.11.4 CUTTING AND PATCHING - PROVIDE ALL NECESSARY CUTTING AND PATCHING AT ROOF, EQUIPMENT PLATFORM DECKING OR WALLS TO ACCOMMODATE: DUCTWORK, PIPING, AND CONDUIT PENETRATIONS. SEAL WATERTIGHT.
- 2.12 OUTSIDE AIR INTAKE HOODS HOODS SHALL BE GALVANIZED STEEL CONSTRUCTION WITH WEATHERPROOF HOOD AND SCREENED OPENING. HOODS SHALL BE SUPPLIED WITH CURB (MINIMUM 12") AND CURBS SHALL BE SHIMMED LEVEL TO ACCOMMODATE ROOF SLOPE. HOODS SHALL BE "PENN AIRETTE" OR APPROVED
- FLEXIBLE DUCT CONNECTION, ON ALL DUCTS CONNECTING TO FANS AND AIR HANDLING UNITS SHALL BE FIRE RETARDANT, CLOSELY WOVEN GLASS FABRIC, DOUBLE COATED WITH NEOPRENE, AND A MINIMUM OF 4 INCHES WIDE. VENT FABRICS OR EQUAL.
- 2.14 ALL DUCTS TO BE GROUNDED ACROSS FLEXIBLE CONNECTION WITH FLEXIBLE COPPER GROUNDING STRAPS.

2.11 <u>DAMPERS</u> — FURNISH ALL VOLUME CONTROL DAMPERS PER PLANS.

- FURNISH AND INSTALL ALL PIPING AS SHOWN ON PLANS. PROVIDE ALL NECESSARY MATERIALS, LABOR, TOOLS, SUPPORTS, CLAMPS, CUTTING AND PATCHING AND PIPE IDENTIFICATION MARKERS.
- 3.2.1 TEST THE SANITARY PIPING THROUGHOUT UPON COMPLETION OF ROUGH-IN BY TIGHTLY CLOSING ALL OPENINGS WITH SCREW PLUGS OR EQUIVALENT DEVICE AND
- 3.2.2 TEST THE DOMESTIC HOT AND COLD WATER PIPING WITH A HYDROSTATIC PRESSURE OF 150 PSI OR 1-1/2" TIMES THE NORMAL WORKING PRESSURE, WHICH EVER IS GREATER, MAINTAINED WITHOUT PUMPING FOR A PERIOD OF FOUR HOURS. TEST AND ADJUST HOT WATER PIPING SYSTEM TO DEMONSTRATE SATISFACTORY
- 3.3 <u>HANGER AND SUPPORTS</u>
- HANGERS AND SUPPORTS SHALL BE OF SUFFICIENT STRENGTH TO SUPPORT THE PIPING. HANGERS AND STRAPPING MATERIAL SHALL BE OF SIMILAR MATERIAL AS THE PIPING TO AVOID GALVANIC ACTION.
- ALL PIPE HANGERS AND SUPPORTS SHALL BE STANDARD PRODUCTS OF ITT GRINNELL CORPORATION OR APPROVED EQUAL. PROVIDE A PROTECTION SHIELD BETWEEN HANGER AND PIPE INSULATION. PROVIDE PIPE SLEEVES AT WALL AND FLOOR PENETRATIONS AND SEAL AIRTIGHT.
- 3.3.3 MISCELLANEOUS SUPPORT STEEL AND ALL PIPE HANGERS SHALL BE PAINTED WITH 1 COAT OF RUST INHIBITING PRIMER AND 2 COATS OF ALKYD SEMIGLOSS
- 3.3.4 HANGER SPACING (MAXIMUM HORIZONTAL SPACING) * COPPER PIPE 1-1/4" AND SMALLER 6 FEET * ALL PIPING 1-1/2" AND LARGER 10 FEET STEEL PIPE FOR CHILLED AND HOT WATER (GLYCOL), STEAM, AND CONDENSATE RETURN:

SUBJECTING THE SYSTEM TO HYDROSTATIC TEST MAINTAINING A 5" HEAD FOR A MINIMUM OF TWO HOURS.

- (2) INCH AND SMALLER, ASTM A53, SCHEDULE 40, GRADE B, TYPE F, BLACK STEEL OR ASTM A106, SCHEDULE 40, GRADE B, TYPE S, BLACK STEEL. HIGH PRESSURE STEAM AND CONDENSATE PIPING SHALL BE SCHEDULE 80, ASTM A53 GR. B, SEAMLESS. (2-1/2) INCH AND LARGER, ASTM A53, SCHEDULE 40, GRADE B, TYPE E, BLACK STEEL OR ASTM A106, SCHEDULE 40, GRADE B, TYPE S, BLACK STEEL. HIGH PRESSURE STEAM AND CONDENSATE PIPING SHALL BE SCHEDULE 40, ASTM A53 GR. B, SEAMLESS
- 3.5.1 2 INCH AND SMALLER SCHEDULE 40, SEAMLESS, THREADED ENDS, ASTM A236 ANSI B16.9
- 2-1/2 INCH AND LARGER SCHEDULE 40, SEAMLESS, BUTT WELD ENDS, ASTM A236 ANSI B16.9
- 2 INCH AND SMALLER SCHEDULE 80, SEAMLESS, THREADED ENDS ASTM A236 ANSI B16.9 2-1/2 INCH AND LARGER SCHEDULE 40, SEAMLESS, BUTTWELD ENDS, ASTM A234 WPB, ANSI B16.9
- COOLING CONDENSATE DRAIN, DOMESTIC WATER AND COMPRESSED AIR
- 3.6.1 SEAMLESS ASTM B88, TYPE L, HARD DRAWN.
- <u>FITTINGS</u> 3.7.1 ASME B16.18, CAST COPPER ALLOY SOLDER JOINT PRESSURE FITTINGS OR ASME B16.22 WROUGHT COPPER SOLDER JOINT PRESSURE FITTINGS.
- 3.8 <u>JOINTS</u>
- 3.8.1 ASTM B32, 95/5 (LEAD FREE) SOLDER
- 3.9 <u>VALVES</u> VALVES, GENERAL: UNLESS SPECIFIED OTHERWISE, CONTRACTOR SHALL SUPPLY ALL VALVES NOT FURNISHED AS AN INTEGRAL PART OF A PIECE OF EQUIPMENT. VALVES SHALL BE OF ONE MANUFACTURER AND SUITABLE FOR TYPE SERVICE, I.E. STEAM, WATER, OIL, GAS ETC., (EXCEPT WHERE FULL LINE OF TYPES OF VALVES ARE NOT AVAILABLE), AND SHALL BE AS MANUFACTURED BY STOCKHAM, WATTS, ROCKWELL, SARCO, NIBCO, WHITEY, SLOAN, DEZURIK, CRANE, OR JENKINS.
- SPECIFIED ABOVE WILL NOT BE ACCEPTED. VALVES 4" AND LARGER SHALL BE GEAR OPERATED WITH CHAIN WHEN 8'-0" A.F.F. 3.10 <u>HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS</u>
- 3.10.1 VALVES 2" AND SMALLER (125 PSI). VALVES 2-1/2 AND LARGER 125 PSI SWP, 200 PSI NON-SHOCK W.O.G., BRONZE, ASTM B-62.
- SCREWED BONNET, RISING STEM, SOLID DISC, AND THREADED ENDS: STOCKHAM B-100. SCREWED BONNET, RISING STEM, SOLID DISC, AND SOLDER ENDS: STOCKHAM B-108. SCREWED BONNET, NON-RISING STEM, SOLID DISC, AND THREADED ENDS: STOCKHAM B-103. SCREWED BONNET, NON-RISING STEM, SOLID DISC, AND SOLDER ENDS: STOCKHAM B-104.

VALVE NUMBERS OF MANUFACTURERS USED BELOW ARE USED ONLY TO ESTABLISH A MINIMUM STANDARD OF QUALITY ONLY. MANUFACTURERS OTHER THAN

- 3.12.1 TWO (2) PIECE DESIGN, 600 PSI, W.O.G., BALL VALVE, BRONZE BODY, CHROME PLATED BRASS BALL, AND REPLACEABLE TEFLON OR "TFE" SEATS AND SEALS.
- BALL VALVES SHALL HAVE BLOWOUT PROOF STEMS AND VINYL COVERED HANDLE. STOCKHAM S-216-BR-RT OR RS AS APPLICABLE.
- SCREWED BONNET, RISING STEM, TEFLON DISC, AND THREADED ENDS: STOCKHAM B-13T. SCREWED BONNET, RISING STEM, TEFLON DISC, AND SOLDER ENDS: STOCKHAM B-14T. SCREWED BONNET, RISING STEM, ANGLE TYPE, AND THREADED END: STOCKHAM B-222. BALL VALVES (200 PSI CWP BRASS BODIES, TEFLON
- 3.14.1 SOLDERED ENDS, SWING TYPE, STOCKHAM NO. B-309. THREADED ENDS, SWING TYPE, STOCKHAM NO. B-319. SOLDERED END, NON-SLAM TYPE, NIBCO INC., NO. S-480. THREADED END, NON-SLAM TYPE, NIBCO INC., NO. T-480. VALVES 2-1/2" AND LARGER (125 PSI) 125 PSI SWP, 200 PSI NON-SHOCK W.D.G. IRON BODY ATM B-62, TWO AND ONE-HALF (2-1/2") INCH AND LARGER.
- 3.15.1 FLANGED END, OUTSIDE SCREW AND YOKE, STOCKHAM G-512. FLANGED END, OUTSIDE SCREW AND YOKE, STOCKHAM G-623.
- 3.16 <u>BUTTERFLY VALVES</u>
- 3.16.1 150 PSI, REPLACEABLE EPDM SLEEVE, NICKEL-PLATED DUCTILE IRON DISK, STAINLESS STEEL STEM, AND EPDM 0-RINGS STEM SEALS, AND LEVER OPERATIONS WITH LOCKS, FLANGED ENDS, JAMESBURY 185L SERIES.
- 3.17.1 FLANGED END, OUTSIDE SCREW AND YORK, STOCKHAM G-512. FLANGED END, ANGLE VALVE, STOCKHAM F-515.

SEATS). THREADED ENDS, STOCKHAM S-216-BR-RT. SOLDERED ENDS, STOCKHAM S-216-BR-RS.

- 3.18.1 FLANGED ENDS, SWING TYPE, STOCKHAM NO. G-932B 3.19 <u>DOMESTIC COLD WATER AND HOT WATER SYSTEMS</u>
- 3.19.1 BALL VALVES 2" AND SMALLER. TWO (2) PIECE DESIGN, 600 PSI, W.O.G., BALL VALVE, BRONZE BODY, CHROME PLATED BRASS BALL, PLATED CARBON STEEL HANDLE WITH VINYL COVER. STOCKHAM S-216-BR-RT OR RS AS APPLICABLE. VALVES 2-1/2" AND LARGER SHALL BE CLASS 125 GATE VALVES, IRON BODY, BRONZE MOUNTED, SOLID WEDGE, FLANGED END, CONFORMING TO ASTM B62 SPECIFICATION. STOCKHAM G-612 OR G-623 OR APPROVED EQUAL.
- 3.20 <u>EMERGENCY SHOWER/EYE WASH MIXING VALVE</u>
- TWO FULLY INDEPENDENT CONTROL MECHANISMS WHICH SPLIT THE FLOW IN HALF, BLEND EACH HALF TO THE DESIGN TEMPERATURE AND THEN INTEGRATE EACH STREAM AT THE OUTLET. THE VALVE SHALL INCLUDE THREE THERMOMETERS TO CONTROL OUTLET TEMPERATURE OVER A WIDE RANGE OF FLOW AND FLOW SHALL BE SUITABLE FOR DELUGE SHOWER OR EYEWASH APPLICATIONS.

- 3.20.2 IN THE EVENT OF INTERRUPTION OF THE COLD WATER SUPPLY, EACH CONTROL MECHANISM CLOSES OFF THE HOT WATER PORT STOPPING ALL FLOW. IN THE EVENT OF INTERRUPTION OF THE HOT WATER SUPPLY, EACH CONTROL MECHANISM SHALL ALLOW COLD WATER FLOW THROUGH BOTH THE FIXED AND
- THE VALVE SHALL BE RATED FOR MAXIMUM INLET PRESSURE OF 125 PSI, MAXIMUM INLET TEMPERATURE OF 180°F AND A RATED CAPACITY OF 25 GPM AT 30
- PSIG INLET PRESSURE. MANUFACTURE SHALL BE LAWLER THERMOSTATIC WATER CONTROLLER MODEL 911. 3.21

SHUTOFF AS MANUFACTURED BY BELL AND GOSSETT.

- FLOW SETTERS FOR WATER SERVICE SHALL BE A COMBINATION BALANCING SHUTOFF/FLOW SENSOR. ALL VALVES EN½ INCH TO 3 INCH PIPE SIZE TO BE OF BRONZE BODY/BRASS BALL G CONSTRUCTION WITH GLASS AND CARBON FILLED TFE SEAT RINGS. VALVES TO HAVE DIFFERENTIAL PRESSURE READ-OUT PORTS ACROSS VALVE SEAT AREA. READ-OUT PORTS TO BE FITTED WITH INTERNAL EPT INSERTS AND CHECK VALVES. VALVE BODIES TO HAVE 1/4 INCH NPT TAPPED DRAIN/PURGE PORT. VALVES TO HAVE MEMORY STOP FEATURE TO ALLOW VALVE TO BE CLOSED FOR SERVICE AND THEN REOPENED TO SET POINT WITHOUT DISTURBING BALANCE POSITION. ALL VALVES TO HAVE CALIBRATED NAMEPLATES TO ASSURE SPECIFIC VALVE SETTINGS. VALVES SHALL BE DESIGNED FOR POSITIVE
- STRAINERS UP TO 2 INCH: SCREWED IRON BODY FOR 250 PSIG WORKING PRESSURE, Y PATTERN WITH 1/32 INCH STAINLESS STEEL PERFORATED SCREEN. OVER 2 INCHES: FLANGED IRON BODY FOR 125 PSIG WORKING PRESSURE, Y PATTERN WITH 3/64 INCH STAINLESS STEEL PERFORATED SCREEN AS MANUFACTURED BY ARMSTRONG OR APPROVED EQUAL.
- 3.23 AIR VENTS SHALL BE FLOAT TYPE BRASS OR SEMI-STEEL BODY, COPPER FLOAT, STAINLESS STEEL VALVE AND SEAT; SUITABLE FOR SYSTEM OPERATING TEMPERATURE AND PRESSURE; WITH ISOLATING VALVE AS MANUFACTURED BY BELL AND GOSSETT. INSTALL AIR VENTS AT HIGH POINTS OF SYSTEM AND AS
- 3.24 <u>THERMOMETERS</u>
- THERMOMETERS FOR AIR SYSTEMS SHALL BE 4-1/2 INCH DIAL WITH CLEAR GLASS WINDOW. THERMOMETERS SHALL BE SELECTED SO THAT THE NORMAL TEMPERATURE READINGS ARE IN THE MIDDLE THIRD OF THE RANGE OF THE THERMOMETER AND BE COMPLETE WITH THERMO WELLS. THERMOMETERS SHALL BE AS MANUFACTURED BY TRERICE INSTRUMENTS OR APPROVED EQUAL.
- THERMOMETERS FOR HYDRONIC AND STEAM SYSTEMS SHALL BE 9 INCH SCALE WITH CLEAR PLASTIC LENS (NO GLASS), RED MERCURY FILLED READING, WHITE FACE AND BLACK NUMERALS. PROVIDED WITH ADJUSTABLE ANGLE STEM AND COATED CAST ALUMINUM CASE. CASE SHALL BE ADJUSTABLE SO THE SCALE IS READABLE FROM THE FLOOR. THERMOMETERS SHALL BE SELECTED SO THAT THE NORMAL TEMPERATURE READINGS ARE IN THE MIDDLE THIRD OF THE RANGE OF
- THE THERMOMETER AND BE COMPLETE WITH THERMO WELLS. THERMOMETERS SHALL BE AS MANUFACTURED BY TRERICE INSTRUMENTS OR APPROVED EQUAL. PRESSURE GAUGES FOR HYDRONIC AND STEAM SYSTEMS, SHALL BE ADJUSTABLE ANGLE STEM INDUSTRIAL TYPE THERMOMETERS WITH COATED CAST ALUMINUM CASE, RED MERCURY FILLED READING COLUMN, CLEAR PLASTIC LENS (NO GLASS), 9-INCH SCALE, WHITE FACE AND BLACK NUMERALS. CASE SHALL BE ADJUSTABLE SO THE SCALE IS READABLE FROM FLOOR LEVEL. SHALL BE 4-1/2 INCH DIAL WITH CLEAR GLASS WINDOW. GAUGES SHALL BE CONNECTED BY BRASS PIPE AND FITTINGS WITH SHUTOFF COCKS. GAUGES SHALL BE SELECTED SO THAT THE NORMAL READINGS ARE IN THE MIDDLE THIRD OF THE RANGE OF THE GAUGE. ON THERMALLY INSULATED EQUIPMENT OR PIPING, STANDOFF MOUNTING BRACKETS, BASES, ADAPTERS, OR EXTENDED TUBES SHALL BE PROVIDED. GAUGES SHALL BE BY TRERICE INSTRUMENTS OR APPROVED EQUAL.
- 3.26 <u>METHODS AND REQUIREMENTS</u> ALL PIPING SYSTEMS SHALL HAVE VALVES AT POINTS SHOWN ON THE DRAWINGS AND AS REQUIRED FOR COMPLETE ISOLATION OF ALL EQUIPMENT, PUMPS, HEATERS, AUTOMATIC VALVES AND TANKS, ARRANGED SO AS TO GIVE COMPLETE AND REGULATING CONTROL OF PIPING SYSTEMS THROUGH OUT THE BUILDING.
- INSTALL VALVES WITH NEAT APPEARANCE AND GROUPING AND ACCESSIBLE, SO THAT ALL PARTS ARE EASILY ACCESSIBLE FOR MAINTENANCE. ALL BRANCHES FROM WATER MAINS FEEDING UP SHALL BE TAKEN FROM THE TOP OF THE SUPPLY MAINS AT AN ANGLE OF FORTY-FIVE (45) DEGREES ABOVE THE HORIZONTAL, UNLESS OTHERWISE DIRECTED. BRANCHES FEEDING DOWN SHALL BE TAKEN FROM THE SIDE OF THE MAIN. ALL CONNECTIONS SHALL BE CAREFULLY MADE TO INSURE UNRESTRICTED CIRCULATION, ELIMINATE AIR POCKETS OR TRAPPED CONDENSATE, AND PERMIT THE COMPLETE DRAINAGE OF THE
- DRAIN VALVES WITH HOSE CONNECTIONS SHALL BE PROVIDED AT LOW POINTS FOR DRAINAGE OF PIPING SYSTEMS. BLOW DOWN VALVES SHALL BE PROVIDED AT

THE ENDS OF ALL MAINS AND BRANCHES SO AS TO PROPERLY CLEAN BY BLOWING DOWN THE LINES THROUGHOUT IN THE DIRECTION OF NORMAL FLOW.

- DISCHARGE LINES FROM ALL RELIEF VALVES SHALL BE PIPED TO WITHIN 4" OF FLOOR DRAINS. SAFETY VALVES SHALL BE PIPED TO ATMOSPHERE IN CONFORMANCE WITH GOVERNING CODES, INCLUDING ALL SAFETY MEASURES RELATED TO PROPER OPERATION.
- SHUTOFF VALVES CAPABLE OF 100 PERCENT DEAD SHUTOFF SHALL BE PROVIDED ON EACH BRANCH LINE FROM THE MAINS ON ALL PIPING, REGARDLESS OF
- SHUTOFF VALVES SHALL BE INSTALLED AT THE INLET AND OUTLET OF EACH INDIVIDUAL PIECE OF EQUIPMENT TO PERMIT ISOLATION FOR MAINTENANCE AND
- PROVIDE MANUAL AIR VENT VALVES AT ALL HIGH POINTS IN ALL THE WATER LINES AS INDICATED ON THE DRAWINGS, OR AS REQUIRED TO VENT THE SYSTEM. PIPE DISCHARGE TO WITHIN 4 FEET OF FLOOR DRAINS.
- 3.26.8 RISING STEM GATE VALVES SHALL BE USED, EXCEPT WHERE PHYSICAL CLEARANCES RESTRICT THEIR USES. 3.26.9 CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND CONDITIONS AT THE BUILDING SITE BEFORE INSTALLATION OF HIS WORK.
- 3.26.10 ALL EXISTING PIPING TO BE VERIFIED IN FIELD.
- 3.26.11 PIPING TO BE INSTALLED IN ACCESSIBLE AREAS. IN CASES WHERE THE PIPING WILL BE EXTENDED THROUGH A SUPPORTING WALL, PERMANENT CEILING OR
- FLOOR, SLEEVES MUST BE INSTALLED. 3.26.12 STERILIZE THE WATER DISTRIBUTION SYSTEM BY THE METHOD APPROVED BY THE AUTHORITY HAVING JURISDICTION
- 3.26.13 ALL CLEANOUTS SHALL BE BRASS, FLUSH MOUNTED TYPE WITH TAMPER PROOF SCREWS.
- 3.26.14 ISOLATE CONNECTIONS BETWEEN DISSIMILAR METALLIC MATERIALS BY USE OF DIELECTRIC FITTINGS OR "CLEAR-FLOW" NIPPLES THAT PROVIDE A COMPLETE ISOLATION OF THE TWO ENDS USING MATERIALS SUITABLE FOR THE DESIGN PRESSURE, TEMPERATURE AND FLUID CONTAINED. ISOLATE NON-FERROUS PIPING PASSING THROUGH OPENINGS IN STRUCTURAL STEEL WITH NONCONDUCTIVE MATERIAL PERMANENTLY ATTACHED TO PIPE.
- 3.26.15 ALL PIPING SHALL BE SLOPED 1" IN FORTY FEET, TO BE RUN PARALLEL TO THE LINES OF THE BUILDING, WITH AT LEAST ONE INCH CLEARANCE FROM OTHER INSTALLATIONS
- ALL INSULATION SHALL BE TESTED FOR FIRE AND SMOKE HAZARD CLASSIFICATION RATINGS IN ACCORDANCE WITH ASTM E84, NFPA 255 AND UL 723. RATINGS SHALL NOT EXCEED FLAME SPREAD CLASSIFICATION 25/50. ALL INSULATION SHALL BE AS MANUFACTURED BY JOHNS MANVILLE CORPORATION, OR APPROVED
- INSULATE SUPPLY AIR, RETURN AIR, AND OUTSIDE AIR DUCTWORK WITH RIGID MINERAL FIBER BOARD; ASTM C612, CLASS 1; "K" VALUE OF 0.22 AT 75 DEGREES F; MINIMUM 3 PCF DENSITY, 1-1/2" INCH THICK WITH ALUMINUM FOIL REINFORCED WITH FIBER GLASS YARN LAMINATED TO FIRE RESISTANT TREATED KRAFT PAPER WITH FACTORY APPLIED VAPOR BARRIER TYPE FACING AND WHITE ALL SERVICE JACKET.
- MINIMUM 0.75 PCF DENSITY, 1-1/2" INCH THICK WITH ALUMINUM FOIL REINFORCED WITH FIBER GLASS YARN LAMINATED TO FIRE RESISTANT TREATED KRAFT PAPER WITH FACTORY APPLIED VAPOR BARRIER TYPE FACING. INSULATE PIPING, AS NOTED, WITH MINERAL FIBER; ASTM C547; "K" VALUE OF 0.23 AT 75 DEGREES F; MINIMUM 4 PCF DENSITY; 1-1/2" INCH THICK WITH

INSULATE SUPPLY AIR, RETURN AIR, OUTSIDE AIR DUCTWORK WITH RESILIENT FIBERGLASS BLANKET; ASTM C612, CLASS 1; "K" VALUE OF 0.27 AT 75 DEGREES F;

- ALUMINUM FOIL REINFORCED WITH FIBER GLASS YARN LAMINATED TO FIRE RESISTANT TREATED KRAFT PAPER WITH FACTORY APPLIED VAPOR BARRIER TYPE FACING AND WHITE ALL SERVICE JACKET. INSULATE PIPING, AS NOTED, WITH ELASTOMER; ASTM C534; "K" VALUE OF 0.27 AT 75 DEGREES F; MINIMUM 5 PCF DENSITY WITH SMOOTH OUTER SURFACE

FINISH. "AP ARMAFLEX"

EQUIPMENT IDENTIFICATION

- MECHANICAL IDENTIFICATION
- ALL MECHANICAL EQUIPMENT SHALL BE IDENTIFIED BY THE NAME AND IDENTIFICATION SHOWN IN THE SCHEDULES ON THE PLANS. TAGS SHALL BE 1-1/2 INCHES BY 4 INCHES ENGRAVED ALUMINUM NAMEPLATES WITH BLACK ENAMEL BACKGROUND AND NATURAL ALUMINUM BORDER AND LETTERS. SIZE OF LETTERS SHALL BE SELECTED TO SUIT EACH APPLICATION. NAME PLATES SHALL BE SECURELY AND PERMANENTLY MOUNTED. NAMEPLATES SHALL BE COORDINATED WITH OWNER'S EXISTING NAMEPLATE SYSTEM AND SHALL BE APPROVED BY OWNER'S REPRESENTATIVE
- CONTROLS IDENTIFICATION
- PROVIDE TAGGING AND LABELING ON CONTROL DEVICES SIMILAR TO AS SPECIFIED FOR VALVES.
- PROVIDE STENCILED PAINTED LABELS ON THE BOTTOM OR SIDES OF ALL PIPING OR INSULATION OF PIPING, MINIMUM OF 2 INCHES HIGH, TO INDICATE LOCATION
- OF ALL CONTROL DEVICES. 5.2.3 IDENTIFY CONTROL PANELS AND MAJOR CONTROL COMPONENTS OUTSIDE PANELS WITH NAMEPLATES.
- BALANCING AND TESTING THE BALANCING CONTRACTOR SHALL SPECIALIZE IN TOTAL SYSTEM AIR AND HYDRONIC BALANCING, TESTING AND COMMISSIONING. THE BALANCING CONTRACTOR SHALL BE CERTIFIED BY THE ASSOCIATED AIR BALANCE COUNCIL (AABC) OR THE NATIONAL ENVIRONMENT BALANCING BUREAU (NEBB) AND SHALL PROVIDE ALL LABOR, ENGINEERING AND TEST EQUIPMENT REQUIRED TO ADJUST AND BALANCE ALL HEATING, VENTILATING AND AIR CONDITIONING AND EXHAUST SYSTEMS AS HEREINAFTER SPECIFIED. ALL PERSONNEL INVOLVED IN THE EXECUTION OF THE WORK UNDER THE BALANCING CONTRACT SHALL BE EXPERIENCED AND FACTORY
- TRAINED SPECIFICALLY IN THE TOTAL BALANCING OF MECHANICAL SYSTEMS, AS WELL AS BEING REGULAR EMPLOYEES OF THE BALANCING CONTRACTOR. THE BALANCING CONTRACT SHALL INCORPORATE THE FOLLOWING:

THE RESPONSIBILITY OF THE CONTRACTOR.

- ADJUST AND BALANCE THE COMPLETE MECHANICAL SYSTEMS INDICATED ON THE PLANS AND SPECIFIED
- RECORD ALL TEST DATA AND SUBMIT FOUR (4) COPIES UPON COMPLETING OF THE BALANCING CONTRACT TO THE OWNER OR HIS REPRESENTATIVE
- INSTALL AT EACH PIECE OF MECHANICAL EQUIPMENT A "DATA REGISTER" SHOWING ALL SIGNIFICANT OPERATING TEMPERATURES. PRESSURES. AMPERES. VOLTAGE. BRAKE HORSEPOWER, ETC. "DATA REGISTER" TO BE ENCLOSED IN VINAFILM HOLDER SECURELY ATTACHED TO THE EQUIPMENT OR WALL IN THE IMMEDIATE AREA. 6.6 ALL TEST EQUIPMENT WILL BE FURNISHED BY THE BALANCING CONTRACTOR AND WILL REMAIN HIS PROPERTY. ALL INSTRUMENTS WILL HAVE BEEN CALIBRATED
- RECENTLY AND VERIFICATION OF CALIBRATION PROVIDED WITH SUBMITTAL DATA. TESTING AND BALANCING SHALL NOT BEGIN UNTIL THE SYSTEM HAS BEEN COMPLETED AND IS IN FULL WORKING ORDER WITH ALL FILTERS INSTALLED IN AIR SYSTEMS AND STRAINERS HAVE BEEN CLEANED IN HYDRAULIC SYSTEMS. THE CONTRACTOR SHALL PUT ALL HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS AND EQUIPMENT INTO FULL OPERATION. CORRECT OPERATION OF EQUIPMENT AND SYSTEM COMPONENTS, AND CLEANLINESS OF PIPING AND DUCTWORK SHALL BE
- ADJUST ALL SYSTEMS TO PLUS 10 OR MINUS O PERCENT OF THE FIGURES INDICATED ON THE PLANS. ADJUST FAN FILTER MODULES TO CFM AIRFLOW
- PROVIDE FINAL ADJUSTMENTS NECESSARY TO ACCOMPLISH CLEAN ROOM PRESSURE RELATIONSHIP WITH ADJACENT AREAS.

Clean Technology, Inc

pennsylvania 18936-9630

phone 215.393.6810 facsimile 215.393.6811

422 stump road montgomeryville

www.aesclean.com

By Date Revisions 70% PROGRESS THIS DOCUMENT MAY NOT, IN WHOLE OR PART

BE COPIED. PHOTOCOPIED. REPRODUCED. Franslated or reduced to any electron

MEDIUM OR MACHINE READABLE FORM

WITHOUT PRIOR CONSENT IN WRITING, FROM

AES CLEAN TECHNOLOGY, INC.

Project

Notes

project no. drawn by checked by RGS NOT TO SCALE scale

04-13-07

Drawing No.

OFFICE USE ONLY

Drawing Title

MECHANICAL

SPECIFICATIONS

	AIR HANDLING UNIT SCHEDULE																											
UNIT					S	SUPPLY FAN D	ATA				OA					COOLIN	IG COIL					FILT	ER	SMOKE	DETECT.	BASIS OF	DESIGN	
NO.	SERVICE	LOCATION	AIRFLOW	ESP	TSP	TYPE OF	FAN	MC	OTOR	ELECTRIC	AIRFLOW	TOT CAP	SENS CAP	EAT	LAT	MAX. VEL.	A.P.D.	FLOW	EWT	LWT	W.P.D.	PRE	FINAL	SUPPLY	RETURN	MANUF	MODEL	REMARKS
			(CFM)	(IN. W.C.)	(IN. W.C.)	CONTROL	BHP R	M HP	RPM	V-PH-HZ	(CFM)	(MBH)	(MBH)	DB/WB	DB/WB	(FPM)	(IN. W.C.)	(GPM)	(F)	(F)	(FT W.C.)	TYPE	TYPE	NO.	NO.			
AHU 1	PROCESS ROOMS	EQUIP. PLATFORM	20,000	4.0	6.5	VFD	31.5 1,1	50 40	1,750	460-3-60	7,000	852.8	624.5	76.6/63.3	48.0/47.9	500	1.00	170	43	53	10.0	30% PLEAT	95% CART	NA	1	HAAKON	495	1,2,3,4,5,6,7,8,9,10,11
AHU 2	PRODUCT SUPPORT ROOMS	EQUIP. PLATFORM	15,000	4.0	6.5	VFD	23.6 1,7	50 30	1,750	460-3-60	9,000	883.1	603.7	84.8/68.1	48.0/47.9	500	1.00	177	43	53	10.0	30% PLEAT	95% CART	NA	1	HAAKON	275	1,2,3,4,5,6,7,8,9,10,12

422 stump road montgomeryville pennsylvania 18936-9630 phone 215.393.6810 facsimile 215.393.6811 www.aesclean.com

NOTES & ACCESSORIES :

1. DOUBLE WALL WITH 2" INSULATION GALVANIZED STEEL PANEL CONSTRUCTION ON WELDED STEEL BASE 2. MIXING BOX WITH BACK AND TOP PARALLEL DAMPERS - AIRFLOW DIRECTED AT EACH OTHER

3. TWO-WAY SLOPED STAINLESS STEEL IAQ DRAIN PAN

4. DIRECT DRIVE PLENUM SUPPLY FAN WITH VARIABLE FREQUENCY DRIVE

5. OPEN, DRIP PROOF WITH HIGH EFFICIENCY E+ MOTORS 6. INTERNAL SPRING ISOLATION WITH ISOLATION BASE TO ISOLATE FAN SECTION AND FLEXIBLE DUCT CONNECTION 7. CHILLED WATER COIL SHALL BE 0.020" COPPER TUBES, ALUMINUM FINS

8. PROVIDE VAPORTIGHT MARINE PENDANT TYPE LIGHTS IN FAN AND ACCESS SECTIONS 9. PROVIDE 120V POWER FOR LIGHTING / RECEPTACLE

10. PROVIDE VIEWING WINDOW IN ACCESS DOORS

11. ACCESS DOORS - LEFT, COIL CONNECTION - LEFT
12. ACCESS DOORS - RIGHT, COIL CONNECTION - RIG

FAN SCHEDULE																		
UNIT			CONST.	WHEEL	FAN					FAN						BASIS OI	F DESIGN	
NO.																REMARKS		
	CFM @ 70 F (IN. W.C.) CONTROL TYPE BHP RPM HP RPM V-PH-HZ																	
EF 1-1	ASEPTIC SUITE	EQUIP. PLATFORM	2	ALUMINUM	UTILITY	10	1,500	4.0	VFD	V-BELT	1.63	1,476	3	1,725	460-3-60	GREENHECK	11-IPA	2,3,4,5,6,7,8,10
EF 1-2	FUME HOODS	EQUIP. PLATFORM	2	ALUMINUM	UTILITY	10	5,000	4.0	VFD	V-BELT	4.61	1,740	7 1/2	1,725	460-3-60	GREENHECK	20-BISW-41	2,3,4,5,6,7,8,10
EF 2-1	GENERAL EXHAUST	EQUIP. PLATFORM	2	ALUMINUM	UTILITY	10	5,000	4.0	VFD	V-BELT	4.61	1,740	7 1/2	1,725	460-3-60	GREENHECK	20-BISW-41	2,3,4,5,6,7,8,10
BF 1-1 ISOLATOR EQUIP. PLATFORM ALUMINUM CENT IN-LINE 1,500 2.0 VFD V-BELT 1.00 1,777 2 1,725 460-3-60 GREENHECK BSQ-140-20 2,4,4														2,4,5,6,7,8,10				

NOTES & ACCESSORIES :

1. GRAVITY-OPERATED BACK DRAFT DAMPER 2. MANUALLY-OPERATED DISCHARGE DAMPER (OPPOSED BLADE)

3. BASE RAIL WITH SPRING VIBRATION ISOLATORS

4. PROVIDE CONTACTOR/DISCONNCT WITH 120VAC COIL INTERFACE FOR ATC 5. ADJUSTABLE MOTOR SUPPORTS WITH FIXED SOLID CORE SHEAVES AND ANTI-FRICTION BALL BEARINGS 6. HI-PRO POLYESTER COATING ON FAN AND ATTACHMENTS 7. SPARK RESISTANT CONSTRUCTION TYPE "B"

8. WEATHER COVER/BELT GUARD, STANDARD ACCESS DOOR, DRAIN AND FLANGED CONNECTIONS

9. ALUMINUM WHEELS, STEEL HOUSING, STEEL MOTOR AND DRIVE HOUSINGS 10. AMCA B CERTIFIED FANS - MANUF. BY NEW YORK BLOWER, GREENHECK, OR APPROVED EQUAL

	STEAM HUMIDIFIER SCHEDULE														
UNIT															
NO.	SERVICE	LOCATION	SIZE			PRESSURE	DIRECTION	TEMP.	ENTERING		ABSORPTION	TUBES	MANUF	MODEL	REMARKS
	(IN. X IN.) (CFM) (LBS/HR) (PSIG) (F) (% RH) (% RH) DIST. (IN.)														
H 1-1	PROCESS ROOMS	AHU 1	32 x 20	20,000	224	15	HORIZONTAL	53	40	70	30				1,2,3,4,5,6,7
H 2-1	PRODUCT SUPPORT ROOMS	AHU 2	48 x 20	15,000	254	15	HORIZONTAL	53	26	70	30				1,2,3,4,5,6,7
													·	·	

NOTES & ACCESSORIES :

1. MULTIPLE INJECTION TUBE FOR USE WITH CLEAN STEAM

2. DUCT HI-LIMIT HUMIDITY SENSOR; AIRFLOW PROVING SWITCH 3. HUMIDSTAT BY ATC; 0-10 VDC CONTROL SIGNAL AND 24V AC TRANSFORMER

4. STAINLESS STEEL STRAINER, DUCT PLATES, AND F&T STEAM TRAPS

5. ELECTRIC STAINLESS STEEL MODULATING STEAM CONTROL VALVE

6. HUMIDIFIERS SHALL BE MOUNTED IN UNIT

	HOT WATER REHEAT COIL SCHEDULE															
UNIT			SIZE	MAX	CAPACITY		All	R			WAT	ER		BAS	SIS OF DESIGN	
NO.	SERVICE	LOCATION	WXH	VELOCITY	(14011)	AIRFLOW	AIR P.D.	EAT	LAT	WTRFLOW	MAX P.D.	EWT	LWT	MANUF	MODEL	REMARKS
(IN.) (FPM) (MBH) (CFM) (IN. W.C.) DB/WB DB/WB (GPM) (FT W.C.) (F) (
RHC 1-1	FERMENTATION SUITE	EQUIP. PLATFORM	50 x 30	800	165.0	7,500	0.5	50	70	16.5	5.0	140	120	MARLO		1,2,3,4,5,6
RHC 1-2	PURIFICATION SUITE	EQUIP. PLATFORM	42 x 30	800	127.6	5,800	0.5	50	70	12.8	5.0	140	120	MARLO		1,2,3,4,5,6
RHC 1-3	PROCESS AIRLOCKS	EQUIP. PLATFORM	24 x 20	800	48.4	2,200	0.5	50	70	4.8	5.0	140	120	MARLO		1,2,3,4,5,6
RHC 1-4	ASEPTIC SUITE	EQUIP. PLATFORM	24 x 20	800	44.0	2,000	0.5	50	70	4.4	5.0	140	120	MARLO		1,2,3,4,5,6
RHC 2-1	QC CHEMISTRY MICROBIOLOGY	EQUIP. PLATFORM	24 x 22	800	55.0	2,500	0.5	50	70	5.5	5.0	140	120	MARLO		1,2,3,4,5,6
RHC 2-2	CORRIDOR A	EQUIP. PLATFORM	28 x 22	800	63.8	2,900	0.5	50	70	6.4	5.0	140	120	MARLO		1,2,3,4,5,6
RHC 2-3	CLEAN STAGING	EQUIP. PLATFORM	22 x 12	800	26.4	1,200	0.5	50	70	2.6	5.0	140	120	MARLO		1,2,3,4,5,6
RHC 2-4	BUFFER PREP.	EQUIP. PLATFORM	20 x 18	800	39.6	1,800	0.5	50	70	4.0	5.0	140	120	MARLO		1,2,3,4,5,6
RHC 2-5	CORRIDOR B, C	EQUIP. PLATFORM	24 x 22	800	57.2	2,600	0.5	50	70	5.7	5.0	140	120	MARLO		1,2,3,4,5,6
RHC 2-6	DIRTY STAGING CLEANROOM	EQUIP. PLATFORM	20 x 16	800	35.2	1,600	0.5	50	70	3.5	5.0	140	120	MARLO		1,2,3,4,5,6

NOTES & ACCESSORIES :

- 1. ALL COILS ARE 1-ROW COILS
- 2. HOT WATER COILS SIZE BASED ON 40% GLYCOL SOLUTION 3. ENTERING WATER TEMP BASED ON RESET SCHEDULE - 180 F/20 F OAT, 120 F/70 F OAT
- 4. TYPE "M" COPPER HEADERS AND 16-GAUGE GALVANIZED CASINGS 5. HOT WATER HEATING COIL CONNECTIONS SHALL BE SAME SIDE
- 6. CONSTRUCT OF 0.01 ALUMINUM FINS, 0.035" X 0.625" COPPER TUBES

				L	DU(CT	SY	ST	ΞM	SC	HE	DU	ILE	7						
			RESSL		A LOCIT CLASS			DUC	Г МАТЕ	RIAL		E)	XTERN	AL DUC	T INSU	JLATIO	N	DU	RNAL ICT IER	
UNIT/SYSTEM	DUCT SYSTEM	PRESSURE (IN. W.G.)	POSITIVE	NEGATIVE	LEAKAGE CLASS	SEAL CLASS	GALVANIZED SHEET METAL	ALUMINUM	16 GA. BL. IRON	316L STAINLESS	FRP	RIGID BOARD	WRAP BLANKET	FLEXIBLE ELASTOMER	VAPOR BARRIER	THICKNESS (IN.)	DENSITY (CU. FT.)	THICKNESS (IN.)	DENSITY (CU. FT.)	KEYED NOTES
AHU 1 AND	SUPPLY AIR	4	•		6	Α	•						•		•	1.5	0.75			А
AHU 2	RETURN AIR	4		•	6	Α	•						•		•	1.5	0.75			А
	MAKE-UP AIR	4		•	6	Α	•						•		•	1.5	0.75			А
EF 1-1 AND	EXHAUST AIR - SUCTION	4		•	6	Α				•			•		•	1.5	0.75			
EF 1-2	EXHAUST AIR - DISCH	4	•		6	Α				•			•		•	1.5	0.75			В
EF 2-1	EXHAUST AIR - SUCTION	4		•	6	Α	•						•		•	1.5	0.75			
	EXHAUST AIR - DISCH	4	•		6	Ā	•						•		•	1.5	0.75			В
	1	1		l			1	1			1	ł		1		I	l			I

GENERAL NOTES:

1. SEE PLANS FOR EXCEPTIONS TO THE ABOVE

2. DUCT SIZES SHOWN ON PLANS ARE SHEET METAL INSIDE DIMENSIONS AND INCLUDE ALLOWANCE FOR INTERNAL LINING

3. ALL ROUND AND FLEXIBLE DUCT FOR THE SYSTEM ARE EXTERNALLY INSULATED AT DISCHARGE OF EXHAUST FANS -SEE DETAIL

4. AT DISCHARGE OF EXHAUST FANS - SEE DETAIL

KEYED NOTES:

A. FLEXIBLE BRANCH DUCT SHALL MATCH INLET OF DIFFUSERS SERVED UNLESS OTHERWISE NOTED B. DOUBLE WALL DUCT, 316 SS INNER & 20 GA ALUMINUM, AMPCO MODEL VSI-II

HOT WATER PREHEAT COIL SCHEDULE																
UNIT																
NO.	SERVICE	LOCATION	WXH	VELOCITY		AIRFLOW	AIR P.D.	EAT	LAT	WTRFLOW	MAX P.D.	EWT	LWT	MANUF	MODEL	REMARKS
			(IN.)	(FPM)	(MBH)	(CFM)	(IN. W.C.)	DB/WB	DB/WB	(GPM)	(FT W.C.)	(F)	(F)			
PHC 1	AHU 1 / AHU 2	EQUIP. PLATFORM	60 X 50	800	1,073.0	15,000	0.5	-20	45	107.0	5.0	180	160	MARLO		1,2,3,4,5,6
NOTE	ES & ACCESSORIES :															

- 1. ALL COILS ARE 1-ROW COILS
- 2. HOT WATER COILS SIZE BASED ON 40% GLYCOL SOLUTION 3. ENTERING WATER TEMP BASED ON RESET SCHEDULE - 140 F/70 F OAT, 180 F/20 F OAT
- 4. TYPE "M" COPPER HEADERS AND 16-GAUGE GALVANIZED CASINGS
- 5. HOT WATER HEATING COIL CONNECTIONS SHALL BE SAME SIDE 6. CONSTRUCT OF 0.01 ALUMINUM FINS, 0.035" X 0.625" COPPER TUBES

	AIR TERMINAL SCHEDULE											
UNIT	NECK	NOMINAL	CFM	MAXIMUM	MAXIMUM	FUNCTION AIR FILTER DATA				BASI	S OF DESIGN	
NO.	SIZE	FACE	RANGE	NOISE	P.D.		FILTER FRAME EFF.		MANUF	MODEL	REMARKS	
	DIA, (IN)	IN x IN		NC	(IN W.G.)	S,R,E	TYPE	TYPE	%			
HFT-1	12	24 x 24	0-350	-	0.47	SUPPLY	LF- MINI PLEAT	NA	99.99	CAMFILL FILTRA	41-DCM	1,2,3,4,5,6,7,8,9,10,12,13,14,18
HFT-2	12	24 x 48	0-650	-	0.47	SUPPLY	LF- MINI PLEAT	NA	99.99	CAMFILL FILTRA	41-DCM	1,2,3,4,5,6,7,8,9,10,12,13,14,18
SR-1	14 x 14	DUCT + 1 3/4"	300-700	26	0.1	SUPPLY	NA	NA	99.99	TITUS	300FS	14,16,18
RAR-1	22 x 22	24 x 24	SEE PLANS	32	0.15	RETURN	NA	NA	99.99	TITUS	8R	14,15,18
EAR-1	14 x 14	DUCT + 1 3/4"	100-700	26	0.1	EXHAUST	NA	NA	NA	TITUS	350FS	14,16,18
EAR-2	14 x 14	16 x 16	100-800	17	0.15	EXHAUST	NA	NA	NA	TITUS	8R	14,15,18
AT-1	42 x 12	42 x 12	400-800	-	-	EXHAUST	NA	NA	NA	DET. 18/ MH-500	HOOD CANOPY	17
	l	1		1		I	1 1		l	1		I

NOTES & ACCESSORIES :

1. LOW-PROFILE DUCTED HEPA FILTER MODULE (DISPOSABLE)

2. MAXIMUM MODULE DEPTH NOT TO EXCEED 4.735" (EXCLUDING 2" DUCT COLLAR)

6. EFFICIENCY: 99.99% @ 0.3 MICRON, 0.47" W.G. RESISTANCE @ 100 FPM

4. DUCT COLLAR WITH INTEGRAL CONTINUOUS RAISED RIDGE 5. 41-mm (1.61") MEDIA PACK COMPLETELY ENCAPSULATED IN POLYURETHANE SEALANT

10. INTEGRAL WHITE EPOXY POWDER-COATED STEEL GRILLE WITH 62% OPEN AREA

7. CENTER DIVIDER W/ DUAL ACCESS PORTS (DAMPER ADJ. PORT, SAMPLE PORT) 8. ROOMSIDE ACCESS PORT FOR ADJUSTABLE AIRFLOW DIFFUSION DISC 9. ROOMSIDE ACCESS PORT FOR AEROSOL TEST CHALLENGE INTRODUCTION OR P.D. MEASUREMENT

11. SUITABLE FOR LAY-IN INSTALLATION IN 1-1/2" "T" GRID OR AES PHARMA ADAPTER FRAME 12. GASKET ON FACE OF HOUSING TO PROVIDE SEAL AT AES PHARMA ADAPTER FRAME

3. HOUSING CONSTRUCTED OF ANODIZED ALUMINUM FRAME MATED WITH GALVANIZED STEEL BACK PLATE 13. TOP AND SIDES INSULATED WITH 1-1/2" FOIL WRAP OR 1/4" RUBATEX INSULATION 14. BORDER TYPE #1 - SURFACE MOUNT. COORDINATE FRAME AND BORDER WITH SURFACE 15. PERFORATED STEEL RETURN/EXHAUST GRILLE WITH BRILLIANT WHITE FINISH

16. ALUMINUM REGISTER OR GRILLE WITH BRILLIANT WHITE FINISH, U.O.N. 17. FABRICATED UNIT COORDINATED WITH CEILING CONSTRUCTION 18. FURNISHED BY AES CLEAN TECHNOLOGY AND INSTALLED BY AES CONTRACTOR

											P	'IPE	ES	YS	TEI	И S	CH	ED	ULI	E													
				DESIG	N				PIPE						FITTIN	G				(CONNI	ECTION				INS	SULATI	ON		JA	CKET		
SYSTEM	PIPE SIZE OR SERVICE	SERVICE SYMBOL	PRESSURE CLASS	MAX. VELOCITY (FPM)	MAX. HEAD (FT / 100 FT)	SEAM	BLACK STEEL (SCH OR WT)	COPPER (TYPE)	PVC (SCH)	STAINLESS (TYPE)	GALVANIZED (SCH)	PLASTIC COATED	STEEL	WROUGHT	CAST IRON	MALLEABLE IRON	SOCKET-FUSION OR SANITARY ENDS	GROOVE	THREAD AND COUPLE	WELD	SOLDER	BRAZED OR SILFLOSS	NEOPRENE GASKET	GASKETED PUSH	SOLVENT WELD	THICKNESS (IN)	GLASS FIBER	CELLULAR FOAM	GLASS MESH W/ W.P. PAINT	ALUMINUM JACKET	KRAFT V.B. JACKET (ASJ)	PVC JACKET	KEYED NOTES
CHILLED WATER	2 AND SMALLER	CHW	150#	45-70				L						•							•					1.5	•				•		F
	2 1/2 AND LARGER	CHW	150#	45-70		ERW	40						•							•						1.5	•				•	1	A,B,E
GLYCOL HOT WATER	2 AND SMALLER	GHW	150#	140-180				L						•							•					1.5	•				•		C,F
	2 1/2 AND LARGER	GHW	150#	140-180		ERW	40						•							•						1.5	•				•		A,B,E
AC CONDENSATE	ALL	CD	90	Amb				L						•							•					0.5	•				•		
CLEAN STEAM	2 AND SMALLER	CS-15	125#	252		1				316L										•						1.5	•				•		
	2 1/2 AND LARGER	CS-15	125#	252						316L										•						2	•				•		
CLEAN CONDENSATE	2 AND SMALLER	CC-15	125#	252						316L										•						1.5	•				•		
	2 1/2 AND LARGER	CC-15	125#	252						316L										•						2	•				•	'	
				<u> </u>			1																								\perp	'	
																																'	
	CENIEDAL MOTEC																																

GENERAL NOTES :

1. SEE PLANS FOR EXCEPTIONS TO THE ABOVE

2. PROVIDE DIELECTRIC UNION BETWEEN DISSIMILAR PIPING MATERIALS 3. INSULATION IN PLENUM SPACES SHALL BE FIRE RATED

KEYED NOTES: A. USE ZERO FLEX RIGID COUPLINGS FOR DISTRIBUTION PIPING

B. USE STANDARD FLEX COUPLINGS FOR ALL FINAL EQUIPMENT CONNECTIONS C. SOLDER TO BE 95/5 LEAD FREE

D. VELOCITY AND PRESSURE DROP PER ASHRAE RECOMMENDATIONS

E. STANDARD WALL FOR PIPE SIZE 12 INCHES AND LARGER F. INSULATION TO TERMINAL UNITS, LESS THAN 12 FEET IN LENGTH, MAY BE REDUCED TO 1/2 G. INSULATION AT EXPOSED TO WEATHER LOCATIONS ONLY

H. PIPING OUTSIDE SHALL HAVE ALUMINUM JACKET

AIR FILTER SCHEDULE																			
					FACE			AIR FILTI	ER										
UNIT	SERVICE	LOCATION	AIRFLOW	FILTER	AREA	EFF.	U.L.	FILTER SIZE	A.P.D. (I	N. W.G.)	BASIS OI	F DESIGN	UNIT SIZE	ARRANG	EMENT	TOTAL UNIT	BASIS	S OF DESIGN	REMARKS
NO.			CFM	TYPE	(S.F.)	(%)	CLASS	(HXWXD)	INIT.	FINAL	MANUF	MODEL	(HXWXD)	Н	W	NO.	MANUF	MODEL	
FIL 1	FRESH AIR INTAKE	EQUIP. PLATFORM	6,000	PLEATED	32	30	2	24"x24"x4"	0.04	0.5	FARR	AEROPLEAT II	96"x51.5"x12"	2	4	1	FARR	4PI GLIDE PACK	

NOTES & ACCESSORIES :

1. FILTERS CONSTRUCTED OF RIGID HEAVY-DUTY BOARD W/DIAGONAL SUPPORT ENCL. FRAMES

2. WELDED MEDIA SUPPORT GRID BONDED TO NON-WOVENCOTTON & SYNTHETIC FABRIC MEDIA 3. SIDE ACCESS, SINGLE STAGE FILTER SYSTEM CONSISTING OF HOUSING, ACCESS DOORS, TRACKS, & HOLDING FRAMES

	AIR FILTER SCHEDULE																				
					FACE AIR FILTER										MEDIA HOUSING						
UNIT	SERVICE	LOCATION	AIRFLOW	FILTER	AREA	EFF.	U.L.	FILTER SIZE	A.P.D. (II	N. W.G.)	BASIS OF	F DESIGN	UNIT SIZE	ARRANG	EMENT	TOTAL UNIT	BASIS	OF DESIGN	REMARKS		
NO.			CFM	TYPE	(S.F.)	(%)	CLASS	(HXWXD)	INIT.	FINAL	MANUF	MODEL	(HXWXD)	Н	W	NO.	MANUF	MODEL			
FIL 1	FRESH AIR INTAKE	EQUIP. PLATFORM	6,000	PLEATED	32	30	2	24"x24"x4"	0.04	0.5	FARR	AEROPLEAT II	96"x51.5"x12"	2	4	1	FARR	4PI GLIDE PACK			

OFFICE USE ONLY

THIS DOCUMENT MAY NOT, IN WHOLE OR PAR BE COPIED, PHOTOCOPIED, REPRODUCED, TRANSLATED OR REDUCED TO ANY ELECTRON MEDIUM OR MACHINE READABLE FORM WITHOUT PRIOR CONSENT IN WRITING, FROM AES CLEAN TECHNOLOGY, INC.								
No	otes	•						

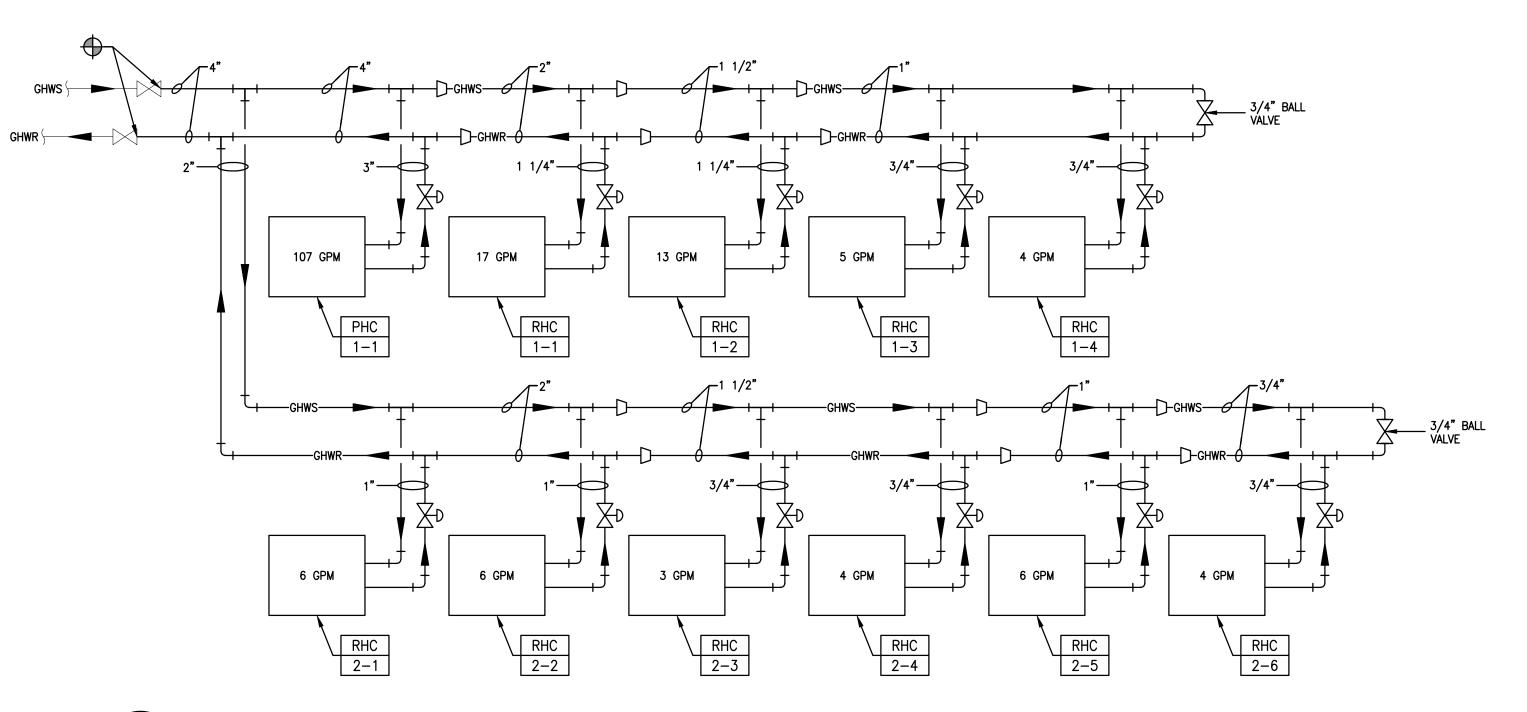
Project

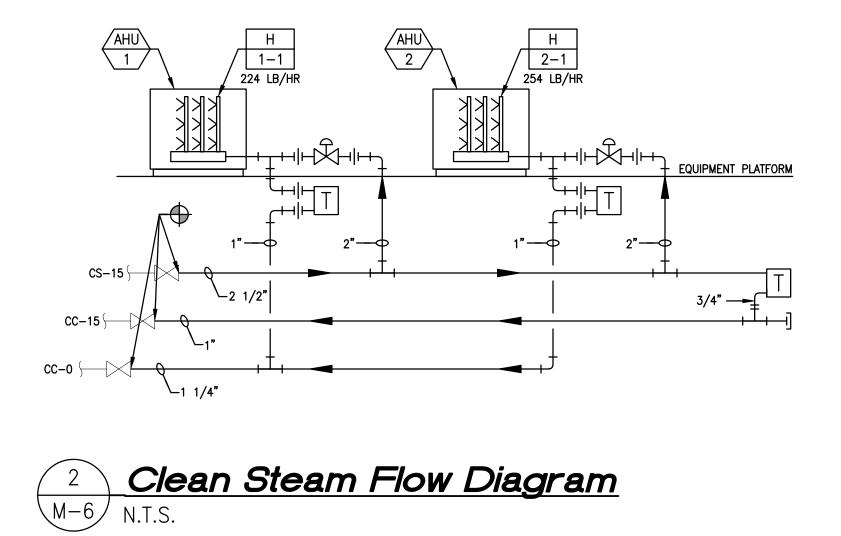
project no. drawn by **checked by** RGS

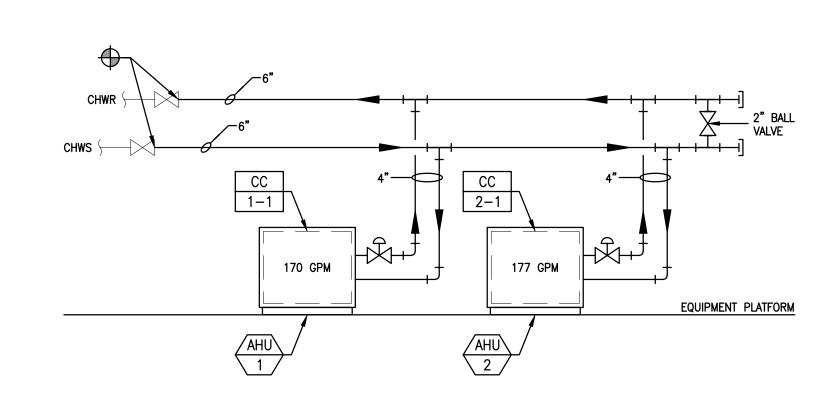
NOT TO SCALE 04-13-07 Drawing Title

> MECHANICAL SCHEDULES

Drawing No.









Chilled Water Flow Diagram

M-6 N.T.S.



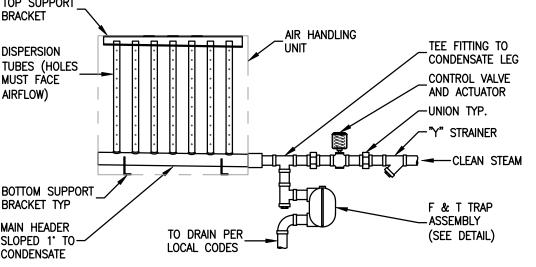
4 Duct Through Equipment Platform
M-6 N.T.S.

PLATFORM.

_ SUPPLEMENTAL SUPPORT BY STEEL FABRICATOR.

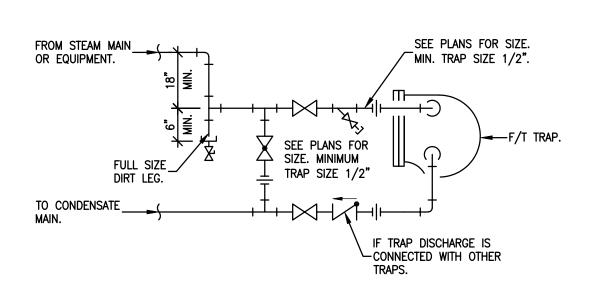
SEE PLANS FOR DUCT PENETRATIONS — & SIZES.





5 Duct Through Equipment Platform

M-6 N.T.S.



Float and Thermostatic Steam Trap Assembly Diagram

> NOTE:
>
> 1. ALL END OF MAIN DRIP TO HAVE 3/4" STEAM TRAPS UNLESS OTHERWISE NOTED.
>
> 2. OMIT CHECK VALVE IF STEAM PRESSURE IS 15 PSIG OR LESS AND CONDENSATE 3. PROVIDE TEST VALVE AT EQUIPMENT ONLY.
> 4. USE FOR ALL STEAM PRESSURE LESS THAN 30 PSI.

THIS DOCUMENT MAY NOT, IN WHOLE OR PART, BE COPIED, PHOTOCOPIED, REPRODUCED, TRANSLATED OR REDUCED TO ANY ELECTRONIC MEDIUM OR MACHINE READABLE FORM WITHOUT PRIOR CONSENT IN WRITING, FROM AES CLEAN TECHNOLOGY, INC.

Clean Technology, Inc.

pennsylvania 18936-9630

phone 215.393.6810 facsimile 215.393.6811

422 stump road montgomeryville

Project

Notes

project no. drawn by checked by

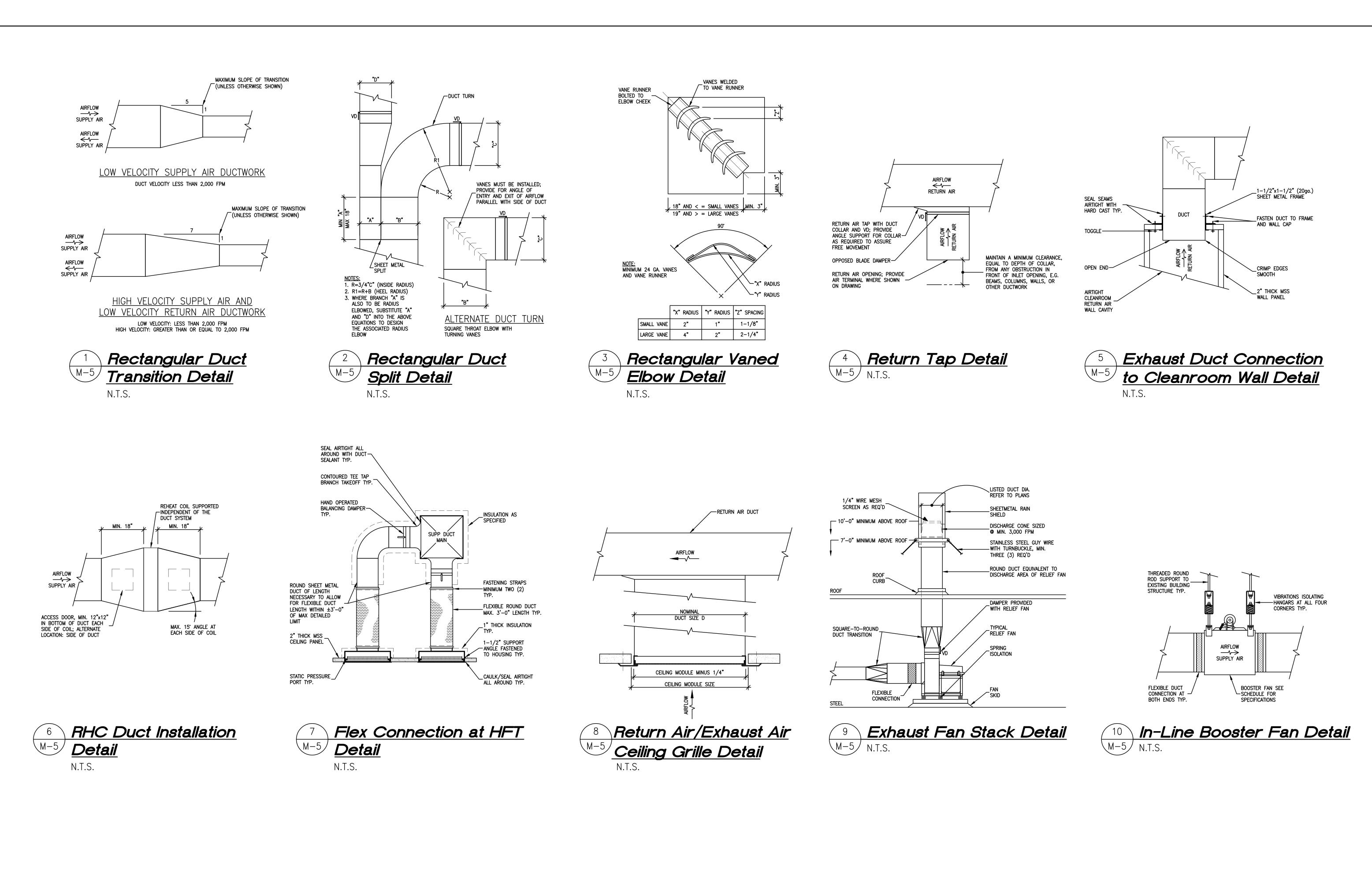
Drawing Title MECHANICAL DETAILS AND

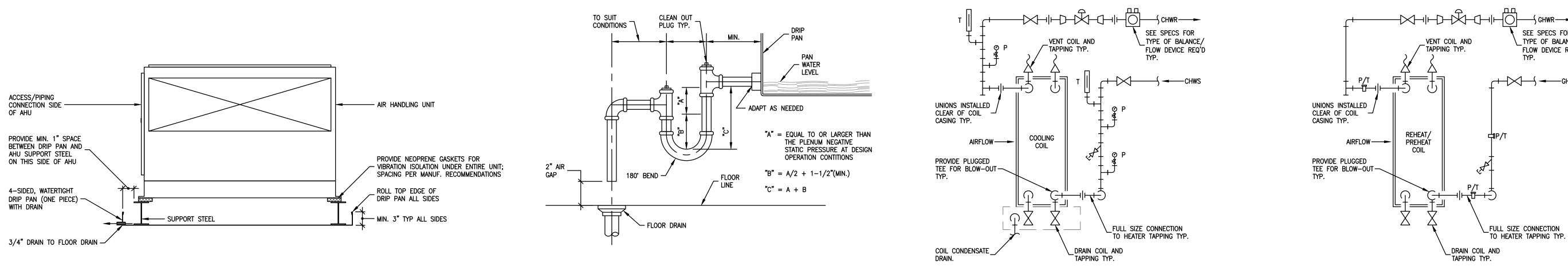
DIAGRAMS

Drawing No.

M-6

OFFICE USE ONLY

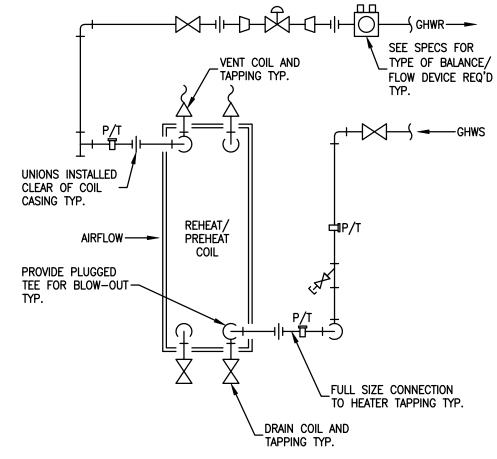




AHU Drip Pan Detail M-5 N.T.S.

Condensate Drain Piping Diagram Draw-Thru Unit

Single Chilled Water Cooling Coil Piping Diagram (Two-Way Control Valve)



Single Glycol Hot Water Reheat /Preheat Coil Piping Diagram (Two-Way Control Valve)

Clean Technology, Inc.

422 stump road montgomeryville pennsylvania 18936-9630 phone 215.393.6810 facsimile 215.393.6811 www.aesclean.com

70% PROGRESS THIS DOCUMENT MAY NOT, IN WHOLE OR PART,
BE COPIED, PHOTOCOPIED, REPRODUCED,
TRANSLATED OR REDUCED TO ANY ELECTRONIC
MEDIUM OR MACHINE READABLE FORM
WITHOUT PRIOR CONSENT IN WRITING, FROM
AES CLEAN TECHNOLOGY, INC. Notes

Project

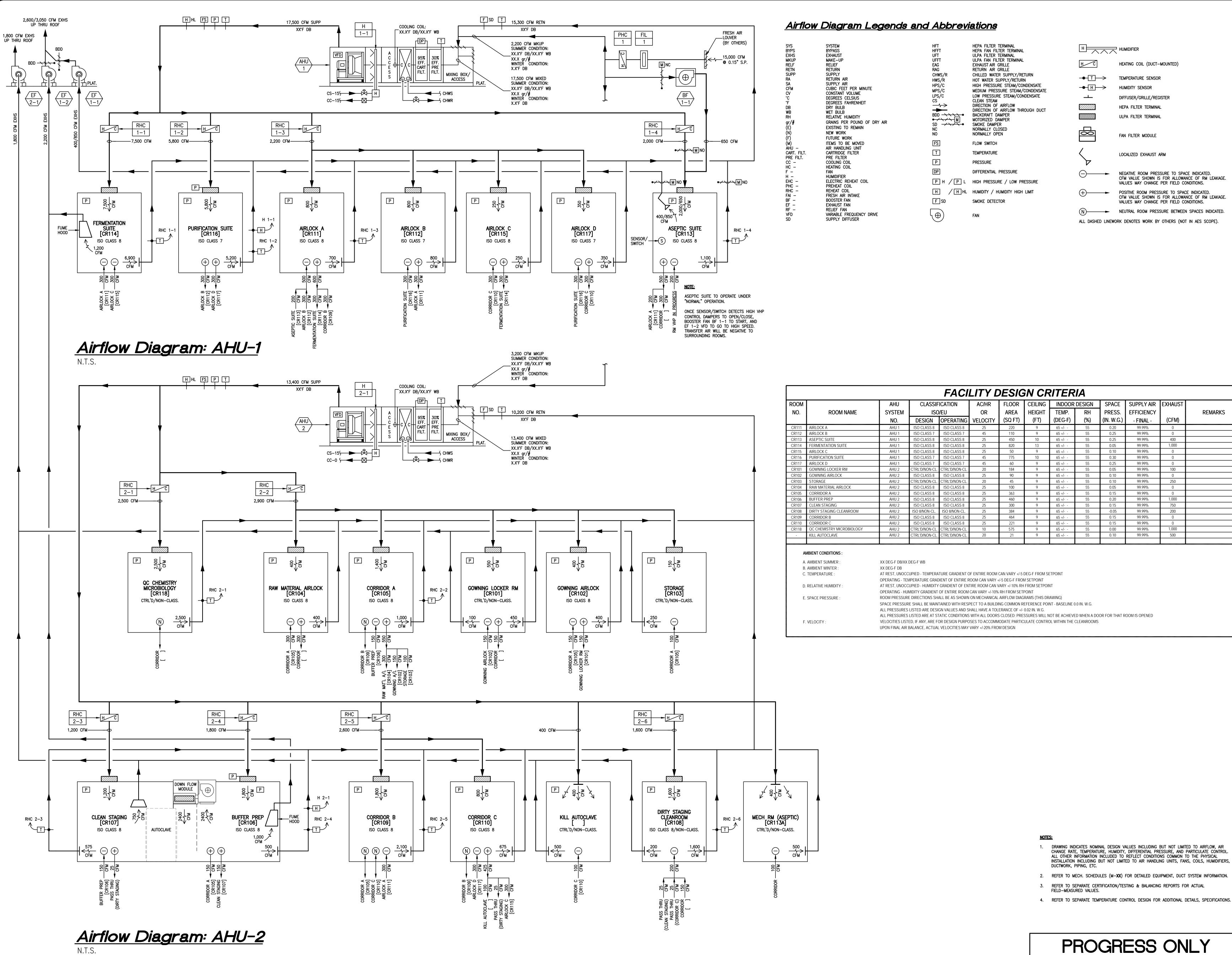
project no.

checked by NOT TO SCALE 04-13-07

Drawing Title MECHANICAL

DETAILS AND DIAGRAMS

Drawing No.



Clean Technology, Inc.

422 stump road montgomeryville pennsylvania 18936-9630 phone 215.393.6810 facsimile 215.393.6811 www.aesclean.com

CFM VALUE SHOWN IS FOR ALLOWANCE OF RM LEAKAGE. VALUES MAY CHANGE PER FIELD CONDITIONS. POSITIVE ROOM PRESSURE TO SPACE INDICATED. CFM VALUE SHOWN IS FOR ALLOWANCE OF RM LEAKAGE.

REMARKS

A 30% PROGRESS TMR 05-04-0 B 70% PROGRESS TMR 06-01-0 HIS DOCUMENT MAY NOT, IN WHOLE OR PART BE COPIED, PHOTOCOPIED, REPRODUCED, RANSLATED OR REDUCED TO ANY ELECTRONIC MEDIUM OR MACHINE READABLE FORM

WITHOUT PRIOR CONSENT IN WRITING, FROM

AES CLEAN TECHNOLOGY, INC.

Notes

Revisions By Date

Project

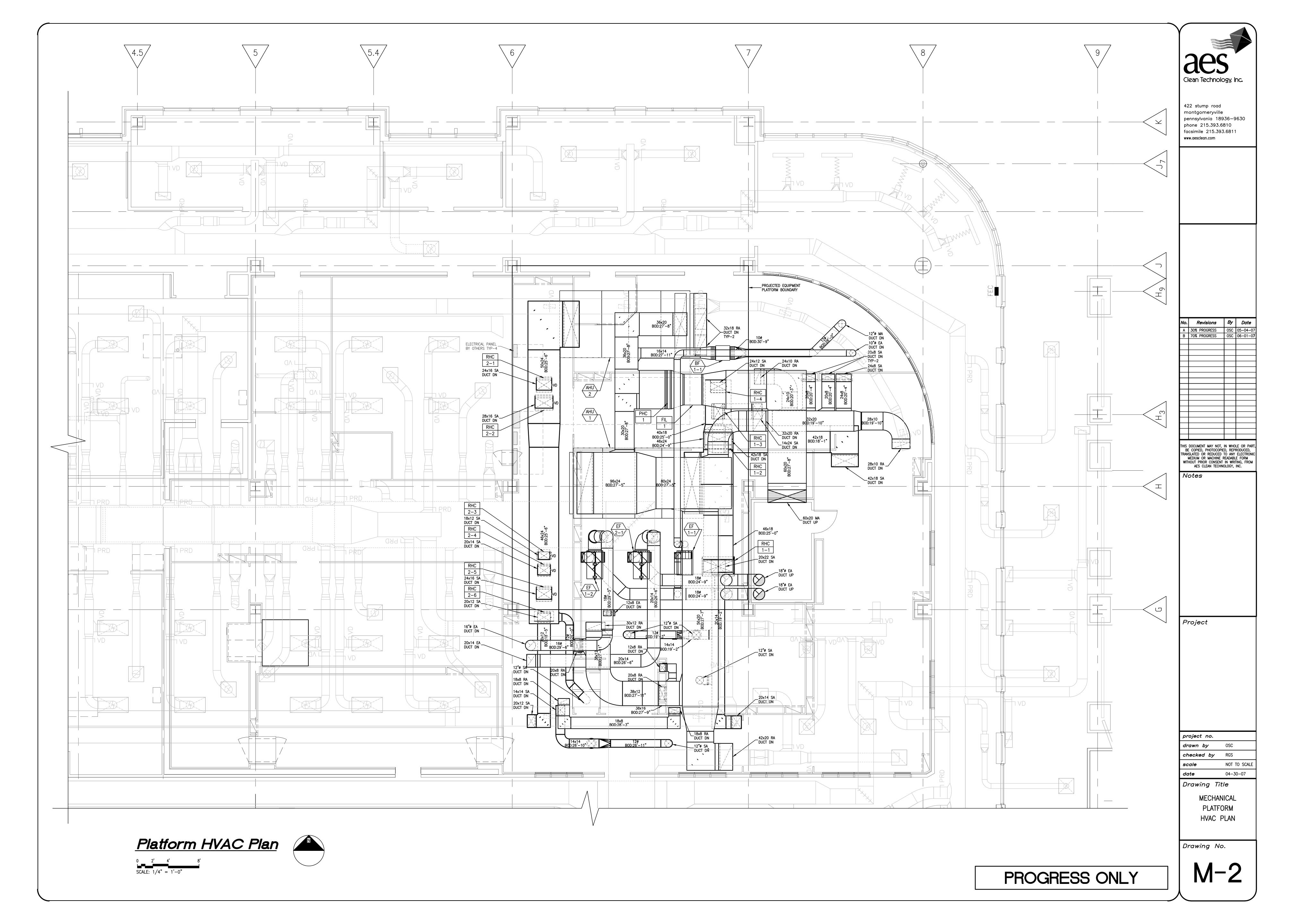
project no. drawn by checked by RGS NOT TO SCALE

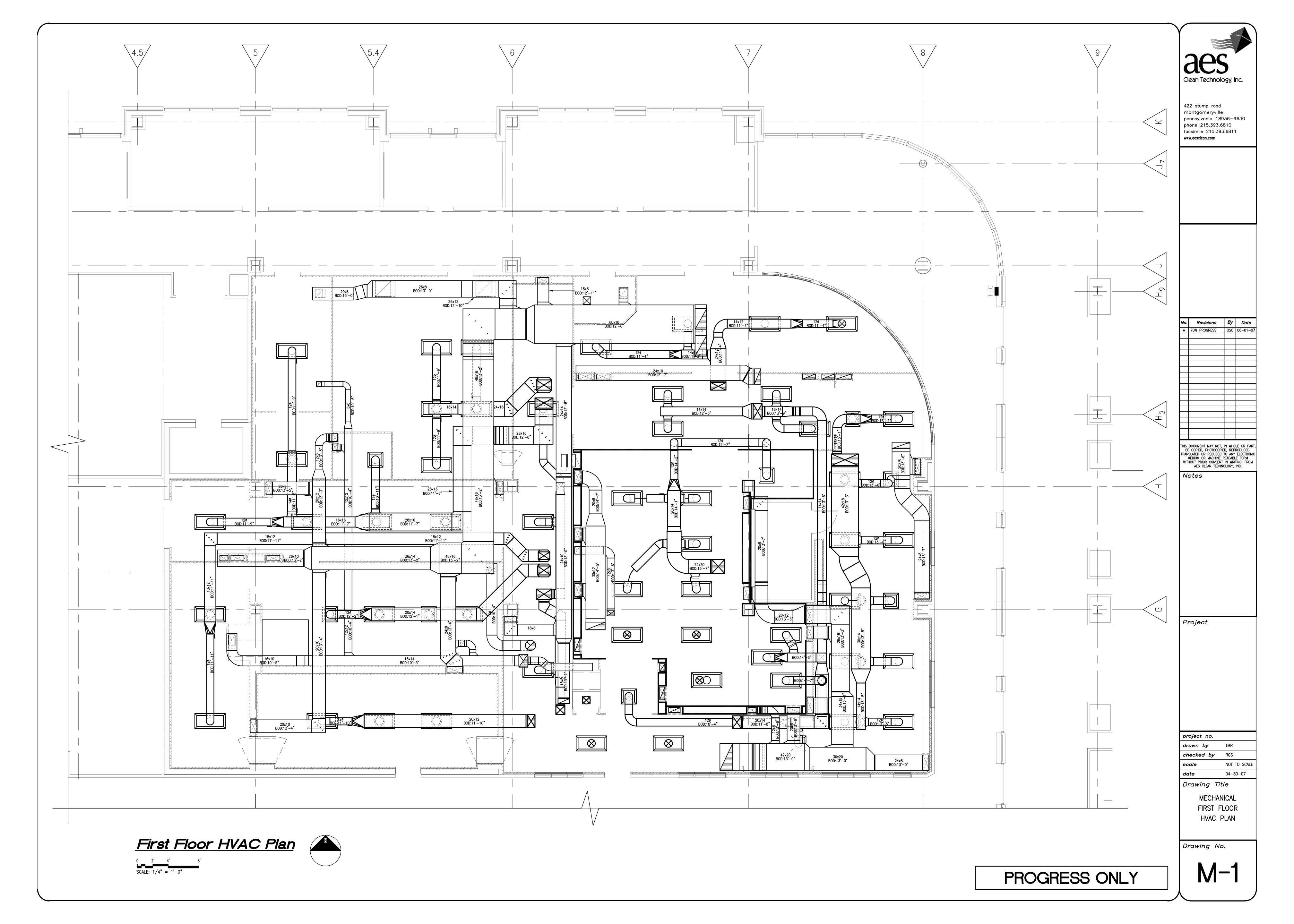
04-13-07

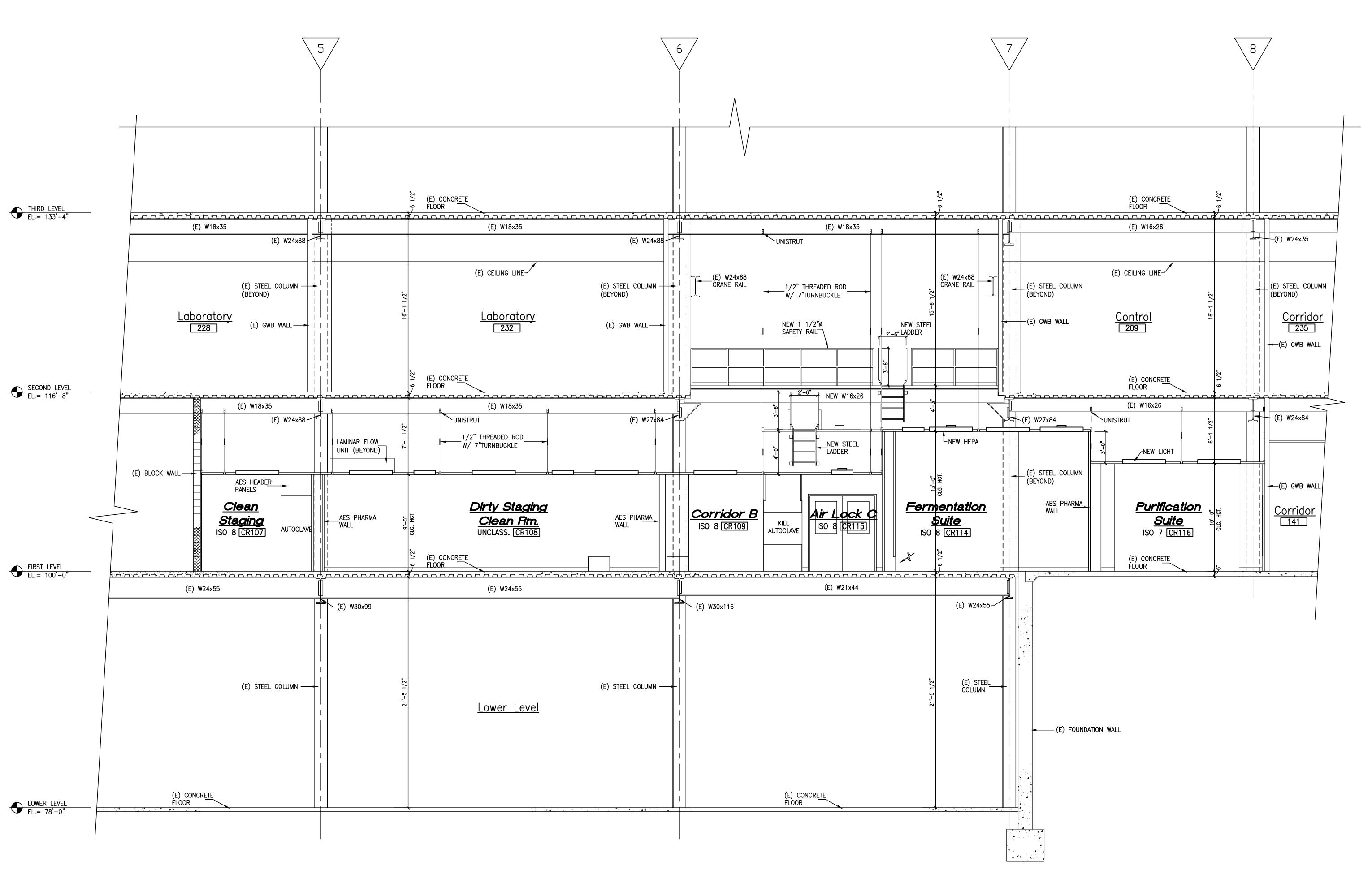
Drawing Title

MECHANICAL AIRFLOW DIAGRAMS AHU-1/AHU-2

Drawing No.











422 stump road
montgomeryville
pennsylvania 18936-9630
phone 215.393.6810
facsimile 215.393.6811
www.aesclean.com

No.	Revisions	Ву	Date					
Α	CLIENT REVIEW	RJB	04-26-07					
В	30% PROGRESS	RJB	05-04-07					
С	70% PROGRESS	RJB	06-01-07					
THIS DOCUMENT MAY NOT, IN WHOLE OR PART, BE COPIED, PHOTOCOPIED, REPRODUCED,								

BE COPIED, PHOTOCOPIED, REPRODUCED,
TRANSLATED OR REDUCED TO ANY ELECTRONIC
MEDIUM OR MACHINE READABLE FORM
WITHOUT PRIOR CONSENT IN WRITING, FROM
AES CLEAN TECHNOLOGY, INC.

Notes

Project



BIOLOGICAL PROCESS

DEVELOPMENT
FACILITY CLEANROOM

Othmer Hall
820 N. 16th St.
Lincoln, NE 68588-0668

project no. 270118

drawn by RJB

checked by RGS

scale 1/4"= 1'-0"

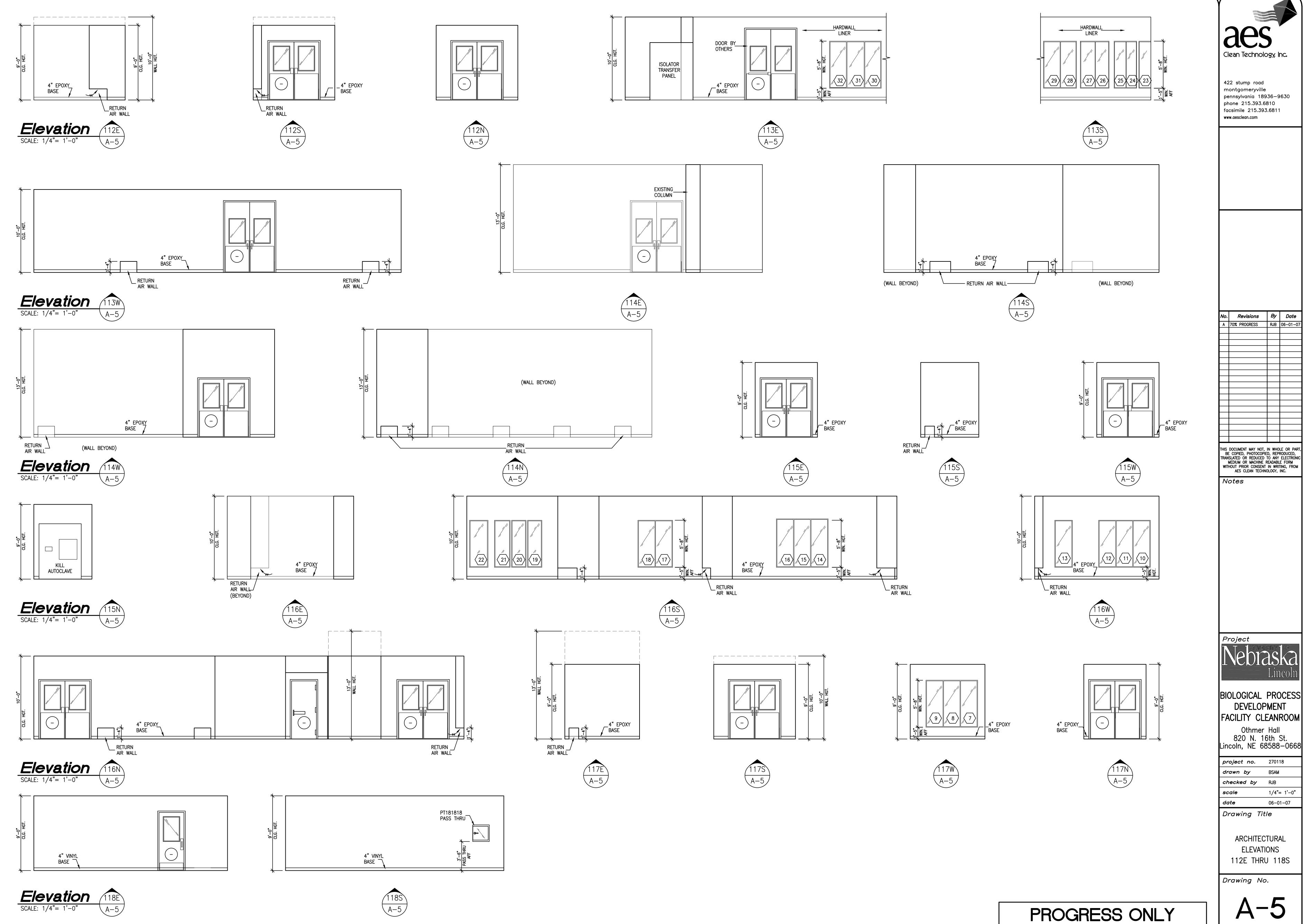
date 05-15-07

date 05-Drawing Title

SECTION A-A

Drawing No.

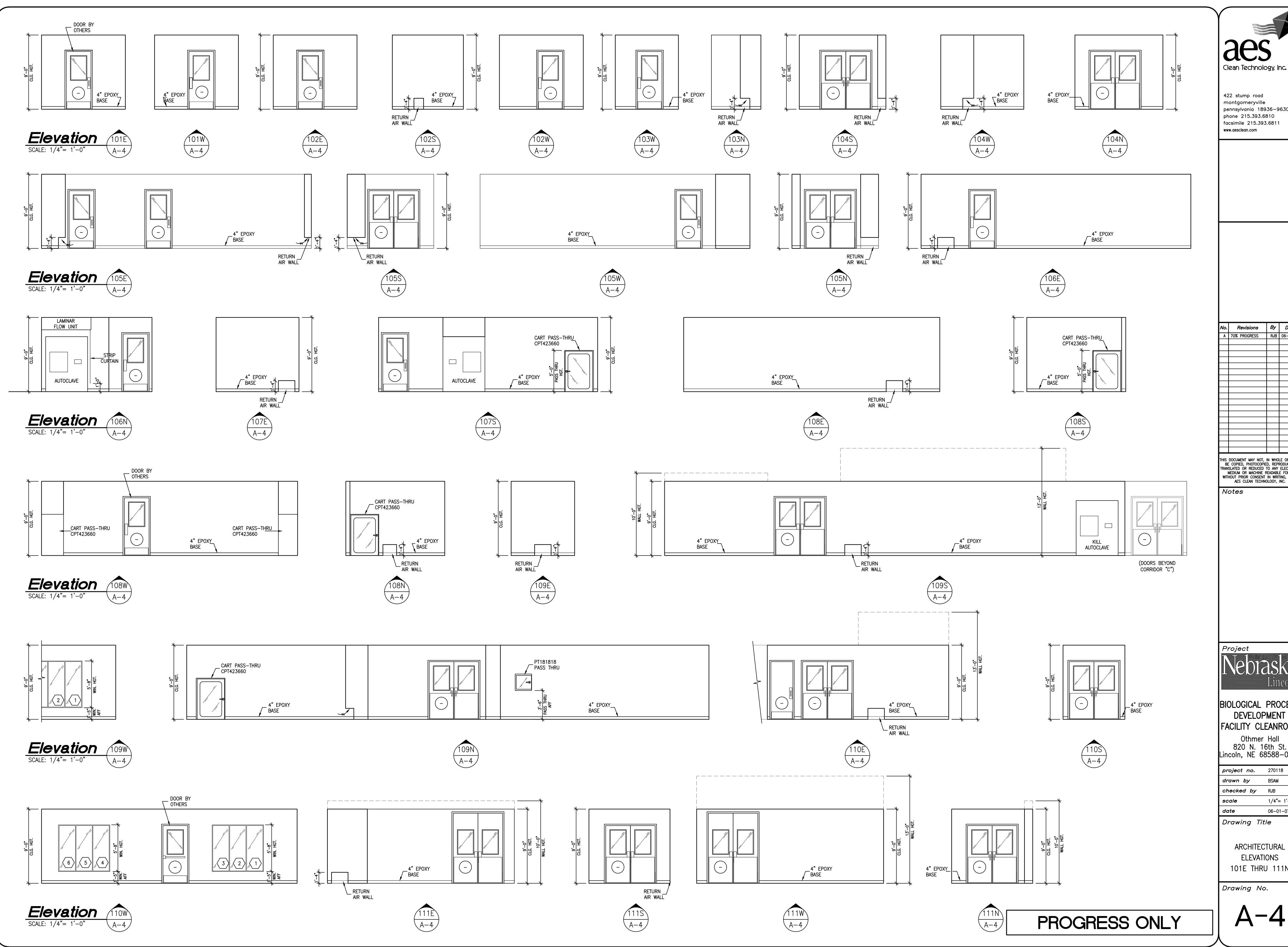
A-6



THIS DOCUMENT MAY NOT, IN WHOLE OR PART, BE COPIED, PHOTOCOPIED, REPRODUCED, TRANSLATED OR REDUCED TO ANY ELECTRONIC MEDIUM OR MACHINE READABLE FORM WITHOUT PRIOR CONSENT IN WRITING, FROM AES CLEAN TECHNOLOGY, INC.

FACILITY CLEANROOM

1/4"= 1'-0" 06-01-07



Clean Technology, Inc.

422 stump road montgomeryville pennsylvania 18936-9630 phone 215.393.6810 facsimile 215.393.6811 www.aesclean.com

A 70% PROGRESS RJB 06-01-0 THIS DOCUMENT MAY NOT, IN WHOLE OR PART, BE COPIED, PHOTOCOPIED, REPRODUCED, TRANSLATED OR REDUCED TO ANY ELECTRONIC MEDIUM OR MACHINE READABLE FORM WITHOUT PRIOR CONSENT IN WRITING, FROM AES CLEAN TECHNOLOGY, INC.

BIOLOGICAL PROCESS DEVELOPMENT FACILITY CLEANROOM

Othmer Hall 820 N. 16th St. Lincoln, NE 68588-0668

project no.	2/0118
drawn by	BSAM
checked by	RJB
scale	1/4"= 1'-0"
date	06-01-07

Drawing Title

ARCHITECTURAL

ELEVATIONS 101E THRU 111N

Drawing No.

A-4

